THE REVIEW
OF APPLIED
ENTOMOLOGY.

SERIES B: MEDICAL
AND VETERINARY.

VOL. XXI.
(1933.)

ISSUED BY THE IMPERIAL
INSTITUTE OF ENTOMOLOGY.

LONDON:
THE IMPERIAL INSTITUTE OF ENTOMOLOGY,
41, QUEEN'S GATE, S.W.7.

1934.

IMPERIAL INSTITUTE OF ENTOMOLOGY.

Executive Council.

Sir Charles J. Howell Thomas, K.C.B., K.C.M.G., *Chairman*, United Kingdom.

Colonel George P. Vanier, D.S.O., M.C., Canada.

F. L. McDougall, C.M.G., Australia.

Nevill L. Wright, F.I.C., New Zealand.

G. W. Klerck, South Africa.

J. M. Adams, F.R.C.Sc. (I), Irish Free State.

Sir Bhupendra Nath Mitra, K.C.S.I., K.C.I.E., C.B.E., India.

B. F. Wright, Southern Rhodesia.

R. V. Vernon, C.B., Colonies, Protectorates and Mandated Territories.

Sir David Chadwick, C.S.I., C.I.E., *Secretary*.

Director.

Sir Guy A. K. Marshall, C.M.G., F.R.S.

Assistant Director and Editor.

Dr. S. A. Neave, O.B.E.

Assistant Director and Superintendent of Farnham House Laboratory.

Dr. W. R. Thompson, F.R.S.

Head Office—British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office—41, Queen's Gate, London, S.W.7.

ERRATA.

Page 1 line 21 for " *shingarevi*, Sching." read " *schingarevi*, Shing."
,, 1 ,, 24 ,, " Perayssú " read " Peryassú "
,, 2 ,, 1 ,, " Christ." read " List."
,, 2 ,, 3 ,, " *C. maculipes* " read " *Anopheles maculipes* "
,, 5 ,, 35 ,, " *Taeniorynchus* " read " *Taeniorhynchus* "
,, 9 ,, 31 ,, " *capistrina* " read " *capistrani* "
,, 64 ,, 5 ,, " P. D. Curry " read " D. P. Curry "
,, 105 ,, 32 ,, " *Leptosylla* " read " *Leptopsylla* "
,, 116 ,, 38 ,, " *sanguineus*, Latr." read " *appendiculatus*, Neum."
,, 127 ,, 1 ,, " *Crociura* " read " *Crocidura* "
,, 129 ,, 29 ,, " 225 " read " 235 "
,, 134 ,, 36 ,, " 123 " read " 128 "
,, 143 5 lines from end for " *campanula* " read " *campanulata* "
,, 144 line 20 for " Borgmeier (R.) " read " Borgmeier (T.) "
,, 149 ,, 26 ,, " lxiv "read " xliv "
,, 251 ,, 15 ,, " red deer and chamois (*C. capreolus*) " read " red deer, chamois and roe deer (*C. capreolus*) "
,, 262 2 lines from end for " *bachmani* " read " *bachmanni* "

IMPERIAL INSTITUTE OF ENTOMOLOGY.

REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES B.

VOL. XXI.] [1933.

EDWARDS (F. W.). **Diptera. Fam. Culicidae.**—*Gen. Ins.*, fasc. 194, 258 pp., 5 pls., refs. Brussels, 1932.

Various changes in nomenclature are made in this important revision of the mosquitos of the world, the following being the author's views of the status and synonymy of certain Anophelines :—*Anopheles aconitus*, Dön. (*albirostris*, Theo.) ; *A. annularis*, Wulp (*fuliginosus*, Giles, *jamesi*, List., *leucopus*, Dön., *lineatus*, Ludl.) with var. *adiei*, James & List. ; *A. annulipes*, Wlk. (*mastersi*, Skuse) ; *A. argyritarsis*, R.-D. (*rooti*, Brèthes, *allopha*, Peryassú) ; *A. bachmanni*, Petrocchi (*davisi*, Patt. & Shann.) ; *A. bellator*, D. & K. (*bromelicola*, Dyar) with vars. *hylephilus*, D. & K., and *cruzi*, D. & K. (*lutzi*, Theo., *neivai*, H., D. & K.) ; *A. claviger*, Mg. (*bifurcatus*, Mg. et auct., *antennatus*, Beck., *turkestani*, Sching.) ; *A. d'thali*, Patt. ; *A. fluviatilis*, James (*listoni*, List., *leptomeres*, Theo.) ; *A. funestus* var. *arabicus*, Christ. & Chand ; *A. gambiae* ab. *melas*, Theo. (*quadriannulatus*, Theo.) ; *A. hyrcanus* var. *popovi*, Sching., and ab. *argyropus*, Sw. ; *A. jeyporiensis*, James (*candidiensis*, Koidz. [but *cf. R.A.E.*, B, xx, 216]) ; *A. lindesayi* var. *japonicus*, Yam. (*pleccau*, Koidz. [but *cf.* xx, 217]) ; *A. ludlowi* var. *hatorii*, Koidz. [but *cf.* xx, 93, 216] ; *A. lutzi*, Cruz (*guarani*, Shann.) ; *A. maculatus*, Theo. (*hanabusai*, Yam.) ; *A. maculipennis* ab. *alexandrae-shingarevi*, Sching. ; *A. majidi*, Young & Majid ; *A. mauritianus*, Grp. (*coustani*, Lav.) ; *A. minimus*, Theo. (*alboapicalis*, Theo.) ; *A. montanus*, Stant. & Hack. ; *A. natalensis*, Hill & Haydon (*aureo-squamiger*, Theo.) ; *A. peryassui*, D. & K. (*alagoani*, Perayssú) ; *A. philippinensis*, Ludl. (*errabunda*, Sw., *freerae*, Banks, *pampagensis*, Brun.) ; *A. plumbeus* var. *barianensis*, James (*intermedius*, Sching.) ; *A. pulcherrimus*, Theo. (*atropotenae*, Lindt.) ; *A. punctimacula*, D. & K. (*venezuelae*, Evans) ; *A. quadrimaculatus*, Say (*annulimanus*, Wulp) ; *A. ramsayi*, Covell (*pseudojamesi*, Strick. & Choud.) ; *A. similissimus*, Strick. & Choud. (*similis*, Strick.) ; *A. splendidus*, Koidz. (*indiensis*, Theo.) [but *cf.* xx, 217] ; *A. stigmaticus*, Skuse (*corethroides*, Theo.) ; *A. superpictus*, Grassi (*vassilievi*, Portsch.) ; *A. tarsimaculatus*, Goeldi (*gorgasi*, D. & K.) ; *A. tessellatus*, Theo. (*punctulatus* var. *orientalis*, Sw. & Sw. de G., *taiwanensis*, Koidz.) ; *A. turkhudi*, List. (*persicus*, Edw.) ; *A. vagus* ab. *immaculatus*, James (*flavus*, Sw.) ; *A.*

willmori, James (*maculosa*, James & Christ.) [but *cf.* xix, 206 ; xx, 217] ; *Bironella gracilis*, Theo. (*Anopheles bironelli*, Christ.) ; *Chagasia bonneae*, Root ; *C. fajardoi*, Lutz ; *C. maculipes*, Theo. (*pseudomaculipes*, Chag.).

Other changes in the nomenclature include the adoption of the names *Aëdes aegypti*, L., for *A. argenteus*, Poir., and *A. scutellaris*, Wlk., for *A. variegatus*, Dol.

Longstaff (T. G.). **An ecological Reconnaissance in West Greenland.**—*J. Anim. Ecol.*, i, no. 2, pp. 119–142, 4 pls., 16 refs. Cambridge, November 1932.

Insects recorded in the course of a pioneer ecological survey of animals and plants in part of the Godthaab district of West Greenland included *Aëdes nigripes*, Zett., and *Simulium vittatum*, Zett., both of which were present in large numbers in willow scrub and attack man. Mosquitos caused annoyance on the snow up to a height of 2,000 ft., but it is believed that reindeer seek comparative relief from them on the higher mountains during the summer. *S. vittatum*, which was even more numerous than *A. nigripes*, was less voracious as a blood-sucker and also fed on vegetable juices.

Missiroli (A.). **Sullo sviluppo di una gregarina del** ***Phlebotomus*****.** [On the Development of a Gregarine of *Phlebotomus*.]—*Ann. Igiene*, xlii, no. 6, pp. 373–377, 1 pl. Rome, June 1932. [Recd. November 1932.]

Monocystis mackiei [*cf.* *R.A.E.*, B, xvi, 100 ; xvii, 228] is recorded from a sandfly, probably *Phlebotomus papatasii*, Scop., in Sicily. A further description of it is given, and as its developmental stages correspond to those of *Lankesteria culicis* it is referred to that genus.

[Gutzevich (A. V.).] **Гуцевич (А. В.). The Reproduction and Development of the Yellow Fever Mosquito under experimental Conditions.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 35–54, 1 graph, 16 refs. Leningrad, 1931. (With a Summary in German.)

In view of the danger of the introduction of dengue into the Russian Union [*cf.* *R.A.E.*, B, xvii, 198], laboratory investigations were carried out from October 1928 to November 1929 on *Aëdes aegypti*, L., in order to obtain precise information on its development, the material employed being larvae and adults collected in Sukhum on the Black Sea coast of Transcaucasia. The female mosquitos were fed exclusively on man, the males receiving no food. Under conditions of sufficient temperature, moisture and intense feeding, laboratory breeding was very easy, a new generation being obtained at any time of the year every three weeks at the optimum temperature of 28°C. [82·4°F.]. The dependence of larval development on temperature may be expressed by the curve proposed by Peairs [*R.A.E.*, A, xvi, 642], 17°C. [62·8°F.] being the minimum at which the larvae can develop. At 28°C. pairing occurred 2–3 days after emergence ; it did not take place at temperatures below 18–19°C. [64·4–66·2°F.] The number of eggs in a batch averaged 50–55, and the maximum number deposited by a female was 204. The mosquitos did not feed or oviposit at temperatures below 16°C. [60·8°F.]. At 28°C. they were ready to take

blood meals every 2–2·5 days, the first feed usually taking place 2–3 days after emergence. Feeding repeated 2 or 3 times was usually followed by oviposition. Under identical conditions the larvae hatched in batches at different times; at 28°C. 10–15 per cent. of the eggs hatched within 2–4 days, and 40–55 per cent. in 5–14 days, the remainder undergoing a prolonged diapause [*cf.* xv, 161; xvi, 183]. This phenomenon is a feature of the adaptability of the species to breeding in temporary and variable accumulations of water. The author believes that the chorion of the eggs varies in thickness, which may account for the difference in the time of hatching. Hatching, may, however, be induced by such physical stimuli as repeated drying up of the breeding-place for periods of about 24 hours, sudden lowering of the temperature of the water, or a slight mechanical injury to the chorion.

From these observations the author concludes that in the southern part of the Black Sea coastal zone of Transcaucasia, where the average air temperature from mid-May till mid-October remains at about 21°C. [69·8°F.], *A. aegypti* may produce 3–4 generations a year, the life-cycle covering 40–45 days. In buildings in which the temperature is kept at or above 20°C. [68°F.] during the winter, development may continue throughout the year.

[BASHKAREVA (A. L.).] **Башкарева (А. Л.). A few Data on Malaria and other Mosquitos of the Sochi Region.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 55–58. Leningrad, 1931. (With a Summary in German.)

A list is given of 7 Culicines and 3 Anophelines observed in 1928 in the Sochi region on the Black Sea coast of Transcaucasia, and the topography and climatic conditions of the country are discussed. Larvae of *Anopheles plumbeus*, Steph., which usually occur in tree holes, were also found in rain-water cisterns and tubs, occasionally in association with those of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.). In the field pupation began on 18th April, the adults emerging 10 days later. In autumn the last pupae were observed on 26th September. *A. maculipennis*, Mg., and *A. claviger* were very common, the pH content of the water harbouring the larvae being 7·3–7·7. The overwintered larvae of *A. claviger* began to pupate on 20th March; the first larvae of *A. maculipennis* were found on 17th April, and the last adults emerged on 29th November.

[PERFIL'EV (P. P.).] **Перфильев (П. П.). Contribution to the Classification of Sandflies** (*Phlebotomus*). [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 73–83, 4 figs., 13 refs. Leningrad, 1931.

Collections of sandflies from Odessa, the southern Crimea, the Caucasus and Uzbekistan contained *Phlebotomus major*, Ann., *P. chinensis*, Newst., and *P. kandelakii*, Shchur. *P. perniciosus*, Newst., was not found. *P. major* is predominant in Alushta (Crimea), but is less abundant in Central Asia and the Caucasus than *P. chinensis*. The male genitalia and the male and female pharyngeal armatures of these two species are described and compared. In Tiflis (Georgia) sandflies of the *perniciosus* group occur sporadically, whereas *P. papatasii*, Scop., and *P. sergenti*, Parrot, are common. Descriptions are

given of variations found in the genitalia of males of *P. chinensis* from various parts of the Russian Union. Sandflies of the *minutus* group collected in Tashkent (Uzbekistan) and Termez (Bokhara) were *P. minutus*, Rond., *P. sogdianus*, Parr. [*cf. R.A.E.*, B, xix, 11, 173], and *P. shortti*, Adler & Thdr., all of which were identified on characters of the pharynx of the females; descriptions of their pharyngeal armatures are given. This is the first record of *P. shortti* from Central Asia.

[Lisova (A. I.).] **Лисова (А. И.). The Cycle of Development of** *Phlebotomus chinensis* **Newstead.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 91–112, 11 refs. Leningrad, 1931. (With a Summary in German.)

A detailed account is given of laboratory observations on sandflies (*Phlebotomus*) carried out from May to September 1927 in Tashkent. No larvae were found in the field. The technique of breeding was a slight modification of one already noticed [*R.A.E.*, B, xiv, 139]. Gravid female sandflies collected in inhabited houses and animal quarters lived 1–9 days in captivity, usually ovipositing on the second day. They died during or immediately after oviposition, the number of eggs laid ranging from 5 to 60. The eggs, which were usually laid at night, were transferred to small saucers containing several thicknesses of damp filter paper, and placed on rabbit faeces. The atmospheric humidity was kept at 80–90 per cent. The duration of the egg stage varied with the temperature from 6 days at an average of 27°C. [80·6°F.] to 14 days at 23·6°C. [74·48°F.]. The larvae proved to be more resistant to excess of moisture than to dry conditions; in many instances they survived three hours' submersion in water [*cf.* xix, 56]. They pass through four instars, the duration of which vary with the temperature. The optimum for development was 26–27°C. [78·8–80·6°F.], higher temperatures being detrimental.

Special observations were made on *P. chinensis*, Newst., the eggs, larvae and pupae of which are described. At an average temperature of 25°C. [77°F.], the egg stage lasted 8 days, the larval 26 and the pupal 12. Characters distinguishing the various larval instars and others differentiating the larvae from those of *P. papatasii*, Scop., are indicated.

[Burakova (L. V.).] **Буракова (Л. В.). Contribution to the Biology of** *Scatopse fuscipes*, **Meig., a possible Enemy of Sandflies** (*Phlebotomus*). [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 113–118, 3 figs., 4 refs. Leningrad, 1931. (With a Summary in German.)

In the course of laboratory investigations on *Phlebotomus* in Uzbekistan [*R.A.E.*, B, xx, 154], larvae of *Scatopse fuscipes*, Mg., were found in breeding dishes that had been left uncovered to allow evaporation of excess moisture. In the infested dishes the larvae of *Phlebotomus* invariably disappeared, but the manner in which they were destroyed by those of *Scatopse* was not ascertained. The adults, larvae and pupae of the latter are described in detail. The eggs were not found. The larvae lived and pupated under the first layer of the rabbit faeces, being probably attracted by a certain amount of dampness. In the summer the life-cycle was completed in 35–45 days, the adults appearing simultaneously with those of the sandflies.

[REÏNHARD (L. V.) & GUTZEVICH (A. V.).] **Рейнгард (Л. В.) и Гуцевич (А. В.). Notes on the Ecology of Mosquitos.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 119–134, 23 refs. Leningrad, 1931.

An account is given of observations on mosquitos in the former Ekaterinoslav Government (Ukraine) in 1926–28, with details of the ecological conditions under which the larvae and adults of the various species occurred and their relative abundance and seasonal prevalence. *Aëdes* (*Ochlerotatus*) *intrudens*, Dyar, and *A.* (*O.*) *sticticus*, Mg., are recorded for the first time from this area. *Anopheles maculipennis*, Mg., and *Culex pipiens*, L., were the most widely distributed mosquitos, the larvae being found in all types of waters and the adults occurring in forests, meadows, dwellings and animal quarters. *A. maculipennis* was sometimes found at a distance of over 3 miles from dwellings. *A. hyrcanus*, Pall., was present in a few places only and was never caught in buildings. *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) and *A. plumbeus*, Steph., were rare, probably owing to conditions unfavourable to the hibernating larvae, as many of the natural accumulations of water are shallow and freeze to the bottom, and in others the overwintered larvae are carried away by the spring floods.

Species of *Aëdes* predominate in spring ; in summer they are almost equalled in numbers by *Anopheles* and *Culex*, which become prevalent in August-September. Contrary to data in the literature, the larvae of *Aëdes dorsalis*, Mg., and *A. caspius*, Pall., were usually found together. The overwintered adults of *Anopheles maculipennis* begin to appear in the first half of April, and the first larvae are found in the last week of the month. The adults of the first generation emerge about mid-May. In October the mosquitos start to congregate in hibernation quarters. The larvae disappear in the first half of November, and the male adults about the middle of the month. The larvae of *A. maculipennis*, *A. claviger*, *Aëdes caspius*, *A. dorsalis*, *A. pulchritarsis*, Rond., *A. geniculatus*, Ol., *Culex modestus*, Fic., and *C. pipiens* are found from the beginning of spring till autumn. The adults of all these species readily attack man in the field, other mosquitos that were observed to do so being *A. hyrcanus*, *Mansonia* (*Taeniorynchus*) *richiardii*, Fic., *Aëdes riparius*, Dyar & Knab (*semicantans*, Mart.), *A. excrucians*, Wlk., *A. cyprius*, Ludl. (*lutescens*, Edw.), *A. communis*, DeG., *A. vexans*, Mg., and *A. cinereus*, Mg. In buildings man and animals were frequently attacked by *Anopheles maculipennis* and *C. pipiens*. The species of *Aëdes* probably hibernate in the egg stage, as no overwintering adults or larvae were ever found. The resistance of the eggs to desiccation was illustrated by an experiment in which eggs of *A. caspius* in soil from a disused water reservoir that had been dry for 18 months hatched when placed in water.

[BUICHKOV (V. A.) & BORZENKOV (A. K.).] **Бычков (В. А.) и Борзенков (А. К.). On the visible Alterations in the digestive Tract of Fleas under the Influence of the Plague Bacillus.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 135–149, 4 figs., 1 graph, 3 refs. Leningrad, 1931. (With a Summary in German.)

A detailed account is given of further investigations on the diagnosis of plague infection in fleas [*cf. R.A.E.*, B, xvii, 131]. Of the fleas used, 65 per cent. were *Neopsylla setosa*, Wagn., 20 per cent. *Ceratophyllus*

tesquorum, Wagn., and 15 per cent. *Ctenophthalmus pollex*, Wagn. The method of preparing the alimentary tract of the fleas is described. When a flea was fed on a healthy laboratory animal, the blood in its stomach was bright red on the day of feeding, but later gradually became thicker and darker, passing through a scale of shades from dark red to brownish black. At 12–15°C. [53·6–59°F.], the stomach was completely emptied of its contents in 12–15 days. In 63 per cent. of the fleas fed on animals infected with plague the blood at first became darker and thicker, but after 4–5 days it turned lighter in colour, gradually attaining whitish brown, whitish grey and pinkish yellow shades. Cultures from stomachs with such light-coloured contents produced rich growths of *Bacillus pestis*. Since these changes in the colour of the stomach-contents have never been observed in healthy fleas, it is believed that they are produced by the plague bacilli, which probably alter the haemoglobin of the blood. It was found, however, that fleas could sometimes be infected with plague without the occurrence of a change in the blood. The appearance of the stomach and proventriculus of plague-infected fleas is described, and a table is given showing the different colours and shades of the blood contained in them.

[Alektorov (A. A.).] **Алекторов (А. А.). Contribution to the Fauna of Mosquitos (Culicidae) of the far-eastern Region of the U.S.S.R.** [*In Russian*.]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 229–248, 6 figs., 5 refs. Leningrad, 1931.

Of the mosquitos discussed, some of which are recorded for the first time from the Russian Far East, *Anopheles hyrcanus*, Pall., the adults and larvae of which are described, was abundant near Nikol'sk-Ussuriĭsk and Khabarovsk, readily attacking man in the field and in houses. Overwintered females appear from the beginning of May, and the first larvae are found in natural water reservoirs in the second half of June. The adults emerge in the middle of July and are abundant till mid-August ; in the second half of this month they disappear from the field, but occur in human dwellings till mid-September. Larvae and pupae are found in the field till October, breeding in clean standing water covered with grass, or in places with a very slow current, and disused rice-fields. The hibernation quarters are not known.

Descriptions are given of the male of *Aëdes cyprius*, Ludl. (*freyi*, Edw.), and the larva of *A.* (*Stegomyia*) *galloisi*, Yam.

[Olenev (N. O.).] **Оленев (Н. О.). Contribution to the Classification and geographical Distribution of the Ticks, Ixodoidea. V.** [*In Russian*.]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 249–261, 4 figs., 5 refs. Leningrad, 1931.

As a result of further study of the collection of ticks in the Zoological Museum of the Academy of Science in Leningrad [*cf.* *R.A.E.*, B, xvii, 130 ; xviii, 102, etc.], detailed notes are given on the distribution in the Russian Union of 14 species of the genus *Hyalomma*, which attack domestic animals. The host of the ticks and the dates on which they were taken are indicated in many instances. Descriptions are given of *H. schulzei*, sp. n., from Persia, and *H. kozlovi*, sp. n., and *H. verae*, sp. n., from Mongolia, but their hosts are not recorded.

[VELICHKEVICH (A. I.).] **Величкевич (А. И.). Contribution to the Ecology and Distribution of Malaria Mosquitos on the southern Coast of the Crimea.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 273–313, 10 figs., 5 graphs, 3 maps. Leningrad, 1931. (With a Summary in German.)

This is a detailed report of an Anopheline survey carried out from April 1928 till December 1929 on a strip of the coast of the southern Crimea about 90 miles long. The character and climatic conditions of the country are discussed. The species found were *Anopheles maculipennis*, Mg., *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.), *A. plumbeus*, Steph., and *A. sacharovi*, Favr, of which only a single individual was taken. An account is given of the various types of water in which the first three Anophelines bred, and the associated vegetation and fauna. Favourable breeding-places are afforded by numerous swamps that are formed at an altitude of about 1,000 ft. by the melting of snow and ice in the Yaĭla mountains and fed by springs. The larvae are also abundant in the many large artificial reservoirs maintained for irrigation. These waters are rich in calcium, with a pH content of 7·2–8, and have good insolation, a favourable temperature and abundant food.

In both 1928 and 1929 the adults of *A. maculipennis* continued to emerge until December, which indicates that if the winter is mild the larvae may develop almost the whole year round. The larvae were most numerous in July and August. None was found at altitudes above 2,300 ft. It was observed that when larvae of *A. claviger* hibernated in layers of ice, the mature individuals were usually killed by being injured by the thawing ice in the spring, but the younger ones were more resistant. The larvae pupated in April at a water temperature of 6–8°C. [42·8–46·4°F.].

[VELICHKEVICH (A. I.).] **Величкевич (А. И.). Contribution to the Fauna of blood-sucking Mosquitos and Sandflies (Diptera, Culicidae and Psychodidae) of the southern Coast of the Crimea.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 315–325. Leningrad, 1931.

Notes are given on the local distribution, ecology, and in some cases biology, of 24 species of mosquitos observed in 1928 and 1929 in the region of Yalta. They included *Aëdes* (*Ochlerotatus*) *caspius*, Pall., *A.* (*Finlaya*) *geniculatus*, Ol., *Theobaldia morsitans*, Theo., and *T. fumipennis*, Steph., all of which readily attacked man and animals and caused serious annoyance. The species of *Theobaldia* hibernate in the larval stage, the adults emerging in April, May and June. The sandflies found were *Phlebotomus papatasii*, Scop., *P. major*, Ann., *P. sergenti*, Parrot, and *P. kandelakii*, Shchur.

OTTEN (L.). **Kritiek op Schuurman's publicaties over pestepidemiologie.** [A Criticism on Schuurman's Publications on the Epidemiology of Plague.]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxii, no. 22, pp. 1529–1536. Batavia, 25th October 1932.

This is another criticism [*cf. R.A.E.*, B, xx, 257] of Schuurman's paper [xix, 170] on the epidemiology of plague in Java.

Soesilo (R.) and others. **Malaria-afdeeling (Jaarverslag van het Geneeskundig Laboratorium over 1931).** [Malaria Division (Annual Report for 1931 of the Medical Laboratory).]—*Meded. Dienst Volksgezondh. Ned.-Ind.*, xxi, no. 3, pp. 170–180. Batavia, 1932.

Anopheles ludlowi, Theo., was not taken in the freshwater fish-ponds at Batavia that had been rendered unsuitable for mosquitos. Many hill areas have become malarious owing to the felling of trees having provided sunny breeding-places for *A. maculatus*, Theo., and the restoration of shade is being proceeded with. For the same reason malaria in South Minahassa is maintained by *A. minimus*, Theo., breeding in water deprived of natural shade. At Sanggau, in Borneo, 689 individuals of *A. umbrosus*, Theo., were caught indoors, of which 3 were infected. Its larvae were taken in sunny and shaded pools. No infection was found in 10 females of *A. tessellatus*, Theo., or in 1 of *A. leucosphyrus*, Dön., which were also taken in houses at Sanggau. In South Malang 75 examples of *A. ludlowi* were taken, mostly indoors, in a locality at an altitude of 1,500 ft. and about 10 miles from the coast, to which the mosquitos had possibly spread gradually along a new road used as a cattle route. Unmistakable differences, shortly to be described, have been found between *A. annularis*, Wulp (*fuliginosus*, Giles), *A. philippinensis*, Ludl., and *A. pallidus*, Theo., in both the larval and adult stages.

Wallace (R. B.). **Cessation of Oiling in a malarious Area during a certain Season of the Year.**—*Malayan Med. J.*, vii, no. 3, pp. 73–81, 7 charts, 4 refs. Singapore, September 1932.

On the two estates in Malaya previously dealt with [*R.A.E.*, B, xix, 71], oiling was suspended in all divisions from 1st or 14th October 1931 until 4th January 1932. There was an increase in the numbers of breeding-places and larvae of *Anopheles maculatus*, Theo., but a decrease in the numbers of adults caught until December, when there was a slight increase. On the other hand, the malaria rate fell steadily until March, when the usual annual rise began on certain divisions. On one division, in which oiling was discontinued entirely, there was no increase in the malaria rate during the 5 months until March, in spite of an increase in the number of breeding-places, larvae and adults. These results confirm the conclusions deduced from previous work [*loc. cit.*].

Badenoch (A. G.). **Twelve Months Records of Mosquito-breeding in Telok Anson with special Reference to Hydrogen-ion Concentration.**—*Malayan Med. J.*, vii, no. 3, pp. 82–87, 12 refs. Singapore, September 1932.

A survey of mosquito breeding-places, with special reference to hydrogen-ion concentration, was carried out over an area of about one square mile in Telok Anson from May 1930 to May 1931. Both Anophelines and Culicines showed a pH range varying from 4·0 to 8·5, which corresponds to the range of waters found in this area. The Anophelines present throughout this range were *A. kochi*, Dön., *A. subpictus* var. *malayensis*, Hack., and *A. vagus*, Dön. *A. barbirostris*, Wulp, *A. hyrcanus* var. *sinensis*, Wied., and *A. hyrcanus* var. *nigerrimus* Giles, were only found in water with a pH of 7–8, but as they have been

successfully reared in the laboratory in a natural water with a pH of 4, it seems probable that they also have a wide range. The records show the places available for Anophelines rather than those selected by them, for the area was oiled once a week. The presence of oil was not found to alter the pH value. The pH value of the various types of water is discussed, together with the effect of the tides in the Perak River. Observations in tidal areas and in two ponds free from oiling indicate that larvae can tolerate considerable and even sudden changes in hydrogen-ion concentration. Neutral and slightly alkaline waters appear to be preferred by the local Anophelines, since waters free from oil were nearly all wells or non-tidal ponds, usually of acid reaction, in which larvae were never very numerous, whereas the slightest carelessness in oiling such alkaline waters as buffalo wallows resulted in the appearance of larvae in a few days.

West (A. P.) & Russell (P. F.). **Experiments with various toxic Substances partially adsorbed on Charcoal as an *Anopheles* Larvicide. Larvicide Studies, IV.**—*Philipp. J. Sci.*, xlix, no. 2, pp. 211–217, 1 pl., 8 refs. Manila, 1932.

The larvicidal value of certain heavy metallic poisons and some miscellaneous non-arsenical substances, including barium chloride, pyrethrum powder, nicotine, tannic acid and rotenone, partly adsorbed on charcoal [*R.A.E.*, B, xx, 236] was tested against Anopheline larvae, using the same technique as in previous experiments. The results indicate that most of them were quite ineffective, and none was so satisfactory as Paris green.

Nono (A. M.). **Avian Malaria Studies, VI. Susceptibility of *Lutzia fuscana* (Wiedemann) Edwards to Avian Malaria.**—*Philipp. J. Sci.*, xlix, no. 2, pp. 225–229, 1 pl., 1 ref. Manila, 1932.

In the experiments described, newly emerged adults of *Lutzia fuscana*, Wied., were fed at night on canaries infected with *Plasmodium cathemerium* and *P. capistrina*. The mosquitos were dissected $6\frac{1}{2}$–$8\frac{1}{2}$ days later, and oöcysts were found on the stomach walls, positive results being obtained with each *Plasmodium*.

Russell (P. F.) & Santiago (D.). ***Anopheles minimus* Larvae from Wells in Laguna Province, Philippine Islands.**—*Philipp. J. Sci.*, xlix, no. 2, pp. 219–223, 1 pl., 9 refs. Manila, 1932.

Anopheles minimus [var. *flavirostris* Ludl., *cf. R.A.E.*, B, xx, 235], *A. barbirostris*, Wulp, and *A. vagus* var. *limosus*, King, are recorded as breeding in wells in which the water is near the surface in the Province of Laguna, Luzon. Malaria is present but in view of the abundance of larvae in streams and the relatively small number found in wells, it is probable the latter do not play an important part in the epidemiology of the disease in this region.

Schwardt (H. H.). **Biology and Control of the Black Horse-fly.**—*Bull. Arkansas Agric. Expt. Sta.*, no. 280, p. 42. Fayetteville, Ark., October 1932.

The black horse-fly [*Tabanus atrătus*, F.], an important pest of cattle in parts of Arkansas, is common in a locality where an outbreak of

anthrax occurred in 1932. It is not unlikely that this species, like some other Tabanids, is capable of transmitting the disease. Studies of its biology have shown that the life-cycle requires about a year, eggs being deposited in June and July and adults emerging during the following summer. A few individuals may complete the life-cycle in as short a period as 68 days, and more rarely an individual larva may hibernate three winters before producing an adult. The vicinity of stagnant waters is the essential habitat of *T. atratus*, the eggs being deposited on sticks or vegetation standing in or near water and the larvae living in the mud bordering the pond. The entire removal of all vegetation or débris projecting above the water, and on shore within 10 feet of the water, will largely prevent oviposition.

Baroody (B. J.). **The Effect of various Chemicals on the Larva and Pupa of *Culex pipiens* at various Temperatures.**—*J. Elisha Mitchell Sci. Soc.*, xlviii, no. 1, pp. 125–129, 1 ref. Chapel Hill, N.C., October 1932.

The toxicity of 14 substances at various dilutions and temperatures was tested against larvae and pupae of *Culex pipiens*, L. The results, which are fairly comparable to those obtained by other workers with *Aëdes aegypti*, L. [*R.A.E.*, B, xix, 250], are tabulated. The solutions acted more quickly at higher temperatures. The larger larvae were more resistant than smaller ones, but less so than the pupae. A dilute solution of iodine killed the larvae but not the pupae, whereas formaldehyde was toxic to both, as was also sodium hydroxide. A mixture of copper sulphate, mercury bichloride, iodine and formaldehyde proved to be an effective larvicide in concentrations as low as 0·0004 per cent.

Meira (J. A.). **Alguns dados estatisticos sobre as pulgas de ratos na cidade de S. Paulo (2a nota).** [Some statistical Data on Rat Fleas in the City of S. Paulo.]—*Brasil-medico*, xlvi, no. 19, pp. 429–432. Rio de Janeiro, 7th May 1932.

In continuation of previous studies on fleas infesting rats in S. Paulo, Brazil [*R.A.E.*, B, xx, 148], a comparison was made between the fleas found in dwellings and in warehouses. The flea-index in warehouses was higher (13·21) than in dwellings (4·91). The following figures show the relative percentage, followed by the flea-index in brackets, of each species of flea in dwellings and warehouses respectively : *Xenopsylla brasiliensis*, Baker, 85·25 (4·19) and 32·86 (4·34) ; *Ctenopsylla musculi*, Dug., 7·51 (0·36) and 46·82 (6·18) ; *X. cheopis*, Roths., 5·83 (0·28) and 18·55 (2·45) ; *Ceratophyllus fasciatus*, Bosc, 0·16 (0·0082) and 1·59 (0·21) ; *Ctenocephalides felis*, Bch., 1·17 (0·057) and 0·122 (0·016) ; *Pulex irritans*, L., 0 and 0·0244 (0·0032) ; *Synosternus pallidus*, Tasch., 0 and 0·0122 (0·0016) ; and *Rhopalopsyllus* sp., 0·056 (0·0027) and 0. *Tunga caecata*, End., was found on 7·98 per cent. of the rats in dwellings and on 1·77 per cent. (10 rats and 1 mouse) of the Murids in warehouses.

de Carvalho (J.). **Dipteros hematophagos do municipio de Ponte Nova (Minas Geraes).** [Blood-sucking Diptera of the Municipality of Ponte Nova.]—*Brasil-medico*, xlvi, no. 34, p. 740. Rio de Janeiro, 20th August 1932.

Mosquitos collected in 1931 in Ponte Nova, a non-malarious district in the Brazilian State of Minas Geraes, were *Aëdes* (*Stegomyia*) *aegypti*, L.,

Anopheles (*Cellia*) *argyritarsis*, R.-D., *A.* (*C.*) *tarsimaculatus*, Goeldi, *A.* (*Myzorhynchella*) *lutzi*, Cruz, *Mansonia* (*Taeniorhynchus*) *fasciolata*, Lynch, *M. titillans*, Wlk., and *Wyeomyia* (*Dendromyia*) sp.

NICOLLE (C.). **Sur l'intérêt d'une étude expérimentale du virus exanthématique des vallées andines.**—*7. Reun. Soc. argent. Pat. reg. Norte, Tucumán, 1931*, i, pp. 1–3. Buenos Aires, 1932.

The author reviews some of the recent work on the characteristics and relationship of the epidemic and endemic (Mexican) forms of typhus [*cf. R.A.E.*, B, xx, 245, etc.] in order to indicate the lines on which it is desirable to study and identify the form of the disease that occurs in the valleys of the Andes, especially in north-eastern Argentina.

MAZZA (S.) & VILLAGRAN (R.). **Accidente de aracnoidismo por escorpión en Ledesma (Jujuy).** [A Case of Arachnoidism caused by a Scorpion at Ledesma, Province of Jujuy.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucumán, 1931*, i, pp. 206–217, 5 figs., 18 refs. Buenos Aires, 1932.

A brief account is given of the symptoms caused in man by the sting of *Tityus* sp. in Argentina, together with a survey of various cases of scorpion stings, some fatal, recorded from Argentina and Brazil. A list of the scorpions of Argentina, with a partial one of Brazilian species, is included.

HIESTAND (W. A.). **Progressive Paralysis of the Nervous System of House Flies by Formaldehyde and Anesthetics.**—*Proc. Indiana Acad. Sci.*, xli (1931), pp. 433–437. Indianopolis, Ind., 1932.

Experiments showed that ingestion of formaldehyde by the house-fly [*Musca domestica*, L.] caused a progressive paralysis of the nervous system, beginning with the posterior end of the abdomen and ending with the mouth-parts and antennae. Anaesthetics gave similar results.

SIMON (M. St. L.). **Diagrams and Sketches of some Insect Vectors and other Arthropoda injurious to Man or Beast.**—9 fldg. pls. London, Garrett & Campbell, Ltd., 1932. Price 4*s*.

This comprises 8 folding plates of line drawings and diagrams showing some of the characters distinguishing the more important genera of Arthropods that are injurious to man or animals, prefixed by an explanatory diagram showing their classification. It has been compiled with a view to avoiding the taking of voluminous notes by students, who are advised to annotate and emend the sketches to bring into prominence the features that it is desired to emphasise.

STEWART (J. L.). **Trypanosomiasis and Tsetse Flies.**—*Rep. Dept. Anim. Hlth. Gold Coast 1931–32*, pp. 11–13. Accra, 1932.

A clearing experiment, based on studies by K. R. S. Morris, was carried out in 1931 and 1932 in an endeavour to control *Glossina tachinoides*, Westw., near Tamale on the Naboggo river, which floods the surrounding country in the rainy season. A very narrow band of evergreen shrubs and trees, giving place a few

yards from the river bank to open grass or thorny scrub, constitutes a primary focus of *G. tachinoides* except during floods. Here the flies are abundant from March until the wet season, breeding being at its height in April and May. The river begins to rise in June, and the floods gradually deprive them of their natural breeding places, and also cause a migration of game to higher ground. The flies follow the game into the long grass of the orchard bush country, where they become lost and probably eventually die of starvation. The floods last about 3 months, during which period the flies also migrate up the side streams, though very little breeding takes place there, and in the following dry season no marked downward migration was noticed. No other secondary or wet weather foci occur. From October or November, when the floods have subsided, until the middle of the following February, when there is a sudden re-population of the river, the fly is completely absent. In order to eliminate it under such conditions, it was considered necessary to clear dense vegetation from the river banks and all the mouths of the streams and swamps draining the area concerned. Clearing was begun in 1931, and by the time of the floods of 1932, it was estimated that the whole area would be cleared. In the intervening dry season no fly was found in the cleared banks, those in course of clearing or in those uncleared, from the time the floods subsided until mid-February, when it appeared simultaneously in numbers both above and below the portion cleared in 1931. It was not found in this cleared part; and in the newly-cleared areas, where vegetation had been cut down and not burned, it gradually decreased as the felled trees and shrubs dried.

Of the tsetse-flies found 95 per cent. were *G. tachinoides* and 5 per cent. *G. palpalis*, R.-D. If the clearing experiment finally proves satisfactory, it will be possible to clear large areas of the country cheaply and effectively.

Anderson (D.). **Notes on Mosquito-borne Diseases in Southern Nigeria: IV. The Sex Ratio of House-haunting Mosquitoes.**—*J. Trop. Med. Hyg.*, xxv, no. 22, pp. 340–343, 4 graphs, 4 refs. London, 15th November 1932.

Analyses of the figures obtained in daily catches of mosquitos carried out in Abeokuta in south-western Nigeria from October 1930 to September 1931 [*cf. R.A.E.*, B, xx, 34, 276] indicated considerable variation in the proportion of the sexes according to the time of year and species, but some sort of relation within the genera. Further house catches carried out from mid-June 1932 to mid-September 1932 in Onitsha brought to light not only considerable differences in the sex ratio of species, but showed that the sex ratio of the Culicines as a whole in Onitsha is different from that in Abeokuta. With the Anophelines there is a very great fall in the percentage of males in the dry season. The proportion of males entering houses is very much less at all times than with the Culicines. Whereas the highest incidence of *Anopheles funestus*, Giles, takes place 3 months later than that of *A. gambiae*, Giles (*costalis*, Theo.), their sex ratio curves are similar. With *A. gambiae* when the total number of mosquitos taken was small the excess of females over males was greater, but this was very much less true of *A. funestus*. In the case of Anophelines a decrease or increase in breeding produced a corresponding decrease or increase of males in the house-haunting mosquitos, but the data relating to Culicines does not

illustrate this, as in their case breeding was comparatively abundant even in the dry season. The figures in regard to *Mansonia* (*Taeniorhynchus*) were remarkable for the small number of males taken.

[Symes (C. B.).] **Section of Medical Entomology.**—*Rep. Med. Res. Lab. Kenya 1931*, pp. 25–29. Nairobi, 1932.

Anopheles pretoriensis, Theo., *A. rhodesiensis*, Theo., and *A. nili*, Theo., were recorded in various districts in Kenya near the Abyssinian border, and *A. mauritianus* var. *tenebrosus*, Dön., in large numbers in Digo district during 1931. As the result of examination of the salivary glands of Anophelines, evidence of malarial infection was only obtained in *A. gambiae*, Giles (*costalis*, Theo.) and *A. funestus*, Giles, and these were the only species found in constant close association with man.

A survey was made in August of a focus of sleeping sickness in Central Kavirondo, and, as in most of the other districts that have been investigated, infection was found to have been contracted during visits to the shore of Lake Victoria through bush infested by *Glossina palpalis*, R.-D. The measures recommended include the clearing of the bush in certain small areas, and the gradual extension of the work to include the breeding-places of *G. palpalis* and reclaim sections of shore previously unoccupied. Precipitin tests showed that elephants were rarely if ever attacked by *G. pallidipes*, Aust., though *Tabanus* spp. exhibited a distinct preference for elephant blood.

In areas where plague is absent the infestation of rats by all species of fleas over a period of six months was only 29 per cent., as compared with over 50 per cent. in infected areas. In transmission experiments *Xenopsylla brasiliensis*, Baker, was found to be the most efficient vector of plague from rat to rat, and *Ctenophthalmus cabirus*, J. & R., was found to carry the disease for the first time. Evidence indicated that *X. brasiliensis* was solely associated with outbreaks of plague in man in two areas ; in one the incidence gradually diminished with a reduction of its numbers on rats and an increase in those of *X. cheopis*, Roths. *X. brasiliensis* has almost invariably been associated with the death of rats in Nairobi. *Rhipicephalus simus*, Koch, a vector of African coast fever of cattle, was recorded during one survey from 65 per cent. of the nests of *Arvicanthis* spp. and from 44 per cent. of surface nests of various field rats.

Lucilia sericata, Mg., and *Chrysomyia bezziana*, Villen., were each obtained from ulcers in man, and the former also from a nasal discharge following a head wound.

Hornby (H. E.) & Bailey (H. W.). **Research on Trypanosomiasis.**—*Ann. Rep. Dept. Vet. Sci. Anim. Husb. Tanganyika 1931*, pp. 10–25. Dar-es-Salaam [1932].

Observations of the incidence of trypanosomiasis of cattle in Tanganyika Territory show that outside the areas in which *Glossina pallidipes*, Aust., is obviously abundant the disease is by no means in direct proportion to the apparent concentration of the fly [*cf. R.A.E.*, B, xvii, 233]. Undoubtedly in some supposedly fly-free areas the existence of *G. pallidipes* is overlooked, but it is equally certain that trypanosomiasis is frequently transmitted by agents other than *Glossina*. Data are given concerning the infection of a healthy herd of Indian water buffalos grazing within a half-mile radius of a farm 20 miles distant from the nearest fly belt, indicating that *Culex fatigans*, Wied., which is

common in the yards where the buffalos sleep, is a possible vector. Healthy oxen herded closely for 10 days with oxen heavily infected with *Trypanosoma congolense* in the presence of numerous Tabanids (*Haemotopota* spp.) failed to develop infection, so that it is concluded that they are not important mechanical transmitters of trypanosomiasis.

Studies of natural immunity in various mammals show that between the almost complete insusceptibility to infection of the elephant and the low resistance of some domestic animals lies the inherently high resistance of wild ruminants. In their wild state they successfully overcome the effects of an infection that is capable of killing them in the less favourable environment of captivity. Under conditions of natural selection approximating those of wild life, local races of immune domestic mammals may arise. The artificial production of immune races of domestic animals is therefore within the bounds of possibility.

PANAYOTATOU (A.). **Les rats et les puces, réservoirs et vecteurs du typhus exanthématique à Alexandrie.**—*C. R. Soc. Biol.*, cxi, no. 34, pp. 496–498, 2 refs. Paris, 14th November 1932.

Emulsions of *Xenopsylla cheopis*, Roths., taken on rats (*Mus norvegicus*) captured at Alexandria were injected intraperitoneally into guineapigs, which subsequently showed symptoms similar to those caused by Mexican [endemic] typhus. Cases of benign typhus have been observed in Alexandria, and these experiments confirm those of other workers in suggesting that *X. cheopis* is responsible for the transmission of the virus from rat to man [*cf. R.A.E.*, B, xx, 245, etc.].

STEFANOPOULO (G.). **Sur le virus amaril d'origine murine inoculé à** *Macacus rhesus*.—*Bull. Soc. Path. exot.*, xxv, no. 8, pp. 866–869, 4 refs. Paris, 1932.

In the course of a series of experiments on the behaviour in monkeys (*Macacus rhesus*) of strains of yellow fever virus that had been maintained in mice, mosquitos [*Aëdes aegypti*, L.] that had fed on a monkey inoculated with the Asibi murine strain (at its 21st passage) were allowed to bite two healthy monkeys 17, 21 and 22 days later. Both monkeys suffered from a non-fatal attack of yellow fever. A similar experiment using the French murine strain at its 147th passage gave negative results.

LINDBERG (K.). **Traitement préventif par la plasmoquine dans un milieu de haute endémicité paludéenne.**—*Bull. Soc. Path. exot.*, xxv, no. 8, pp. 912–919. Paris, 1932.

In the course of this paper notes are given of the breeding-places and seasonal distribution of the larvae of *Anopheles culicifacies*, Giles, *A. pallidus*, Theo., *A. annularis*, Wulp (*fuliginosus*, Giles), *A. hyrcanus* var. *nigerrimus*, Giles, *A. subpictus*, Grassi, and *A. stephensi*, List., and on the types of shelter in which adults of some of the species were found, as observed during a period of two years in a railway colony in the south-west part of the Deccan. Treatment of malaria cases with plasmochin was carried out in 1931, and evidence was obtained that the treatment of gametocyte carriers resulted in a considerable diminution in the number of new infections.

Treillard (J.). **Répartition annuelle de** *Myzomyia minima, M. aconita* **et** *Anopheles hyrcanus,* **anophèles porteurs de** *Plasmodium* **malariens en Cochinchine et au Cambodge oriental.**—*Bull. Soc. Path. exot.*, xxv, no. 8, pp. 920–928, 2 diag., 1 ref. Paris, 1932.

This paper, which is part of a more comprehensive one not yet published, deals with the seasonal distribution of *Anopheles* (*Myzomyia*) *minimus*, Theo., *A.* (*M.*) *aconitus*, Dön., and *A. hyrcanus*, Pall., the three principal vectors of malaria in Cochin China and Cambodia, the data being based on collections of 10,435 adults from 1929 to 1931 in 53 localities. There appears to be a definite relation between seasonal factors, such as rainfall, and the abundance of Anophelines. Moreover, there is a short period when the adults of all three species are present in small numbers only, and it is suggested that control measures might be applied with advantage at this time.

Dias (E.). **Sur les déjections du** *Triatoma megista.* **Aspects du** *Trypanosoma cruzi* **que l'on y rencontre.**—*C. R. Soc Biol.*, cxi, no. 33, pp. 486–489, 2 figs., 2 refs.

Dias (E.). **Expériences sur la transmission du** *Trypanosoma cruzi* **de l'insecte au vertébré.**—*T.c.*, pp. 490–492, 5 refs. Paris, 4th November 1932.

The author's observations in Brazil show that the excretion from the malpighian tubes in *Panstrongylus* (*Triatoma*) *megistus*, Burm., is of two types, one a colourless, transparent fluid that is eliminated only during the first hours after feeding, and the other a cloudy yellow liquid, rich in crystals. The first type is particularly interesting in that, when it is derived from individuals infected with *Trypanosoma cruzi*, it nearly always contains flagellates, and sometimes these are numerous [*cf. R.A.E.*, B, xix, 81]. In the experiments described in the second paper, guineapigs were not infected by the bites of *P. megistus* previously fed on an infected animal, although positive results were obtained when the clear excretion from the same bugs was placed on the unbroken skin of the back of the neck or in the eye of other guineapigs.

Papers noticed by Title only.

Sergent (Ed.), Donatien (A.), Parrot (L.) & Lestoquard (F.). **La transmission naturelle de la theilériose bovine dans l'Afrique du nord** [*Theileria dispar* transmitted by *Hyalomma mauritanicum*, Senevet, in Algeria].—*Arch. Inst. Pasteur Algérie,* ix, no. 4, pp. 527–595, 9 pls., 15 figs., num. refs. Algiers, 1931. [For summary see *R.A.E.*, B, xx, 43.] [Recd. November 1932.]

Parrot (L.). **Notes sur les phlébotomes.—IV.** *Phlebotomus perfiliewi* **n. sp.** [described from males from the Crimea].—*Arch. Inst. Pasteur Algérie,* viii, no. 3–4, pp. 382–385, 2 figs. Algiers, 1930. [Recd. November 1932.]

[Kazantzev (B. N.).] **Казанцев (Б. Н.). Variations in the Colouring of the Bokhara** *Aëdes caspius.* [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 85–90, 2 figs., 3 refs. Leningrad, 1931. (With a Summary in German.)

[Andrezen (E.).] **Андрезен (Э.). Alterations in the Eye of the Rabbit under the Influence of the poisonous active Principle of the Beetle** *Paederus albipilis* **Solsky.** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 151–156, 3 figs., 5 refs. Leningrad, 1931. (With a Summary in German.)

[Stein (A. K.).] **Штейн (А. К.). On the Treatment of the eczematous Dermatitis caused by the Beetles** *Paederus fuscipes* **and** *P. albipilis* **(Fam. Staphylinidae).** [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 177–179. Leningrad, 1931.

[Blagoveshchenskiĭ (D. I.).] **Благовещенский (Д. И.). Contribution to the Anatomy of the Louse of the Guineapig**—*Gyropus ovalis.* [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 181–228, 8 pls., 27 refs. Leningrad, 1931. (With a Summary in German.)

[Pavlovskiĭ (E. N.) & Stein (A. K.).] **Павловский (Е. Н.) и Штейн (А. К.). An experimental Investigation on the Effect on the human Skin of the Bite of the Black Cockroach** (*Periplaneta* [*Blatta*] *orientalis*). [*In Russian.*]—*Mag. Parasit. Mus. zool. Acad. Sci. URSS.*, ii, pp. 263–272, 50 refs. Leningrad, 1931. [For German translation see *R.A.E.*, B, xix, 262.]

Kopstein (F.). **Die geographische Verbreitung von** *Xenopsylla astia* **in Java und ihre Bedeutung für die Epidemiologie der Beulenpest.** [The Distribution of *X. astia*, Roths., in Java and its Importance to the Epidemiology of Bubonic Plague.]—*Z. Hyg. u. InfektKr.* cxiv, no. 2, pp. 289–301, 41 refs. Berlin, 1932. [Translation of *R.A.E.*, B, xx, 176.]

True, jr. (G. H.). **Studies of the Anatomy of the Pajaroello Tick,** *Ornithodorus coriaceus* **Koch. I. The Alimentary Canal.**—*Univ. California Publ. Ent.*, vi, no. 3, pp. 21–48, 3 pls., 17 figs., 13 refs. Berkeley, Cal., 1932.

Kröber (O.). **Familie Tabanidae (Bremsen).**—*Tierw. Deutschl.*, xxvi, pp. 55–99, 92 figs. Jena, 1932.

Kröber (O.). **Das Genus** *Stibasoma* **Schin. (Tabanidae, Diptera).**—*Stettin. ent. Ztg.*, xciii, pt. 2, pp. 241–259, 6 figs. Stettin, 1932.

Sinton (J. A.). **Some further Records of** *Phlebotomus* **from Africa** [including *P. meilloni*, sp. n., and two new varieties].—*Ind. J. Med. Res.*, xx, no. 2, pp. 565–576, 3 pls., 11 refs. Calcutta, October 1932.

Sinton (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. *Phlebotomus eadithae* **n. sp.**—*Ind. J. Med. Res.*, xx, no. 2, pp. 577–580, 1 pl., 9 refs. Calcutta, October 1932.

Buxton (P. A.). **Terrestrial Insects and the Humidity of the Environment.**—*Biol. Rev.*, vii, no. 4, pp. 275–320, 4 figs., 6 pp. refs. Cambridge, October 1932. [See *R.A.E.*, A, xxi, 2.]

Carter (H. R.). **Yellow Fever. An Epidemiological and Historical Study of its Place of Origin.**—Med. 8vo, xii+308 pp., 1 pl., 1 fig., 3 maps, 18 pp. refs. Baltimore, Md., The Williams & Wilkins Co., London, Baillière, Tindall & Cox, 1931. Price 26*s*. 6*d*. [Amended Notice showing London Agents, *cf. R.A.E.*, B, xx, 277.]

Senevet (G.). **Contribution à l'étude des nymphes de culicides. Descriptions de celles de certains anophélinés et plus spécialement des espèces européennes et méditerranéennes.**—*Arch. Inst. Pasteur Algérie*, viii, no. 3–4, pp. 297–382, 48 figs. Algiers, 1930.

Senevet (G.). **Contribution à l'étude des nymphes d'anophélinés (2e et 3e mémoires).**—*Op. cit.*, ix, no. 1, pp. 17–112, 57 figs.; x, no. 2, pp. 204–254, 21 figs. Algiers, 1931–32.

The first paper of this series is a reprint of one already noticed [*R.A.E.*, B, xx, 69] in which the key to the pupae includes *Anopheles rufipes*, Gough, as well as the species already recorded.

In the second paper descriptions are given of the pupae of *Anopheles turkhudi*, List., *italicus*, Raff., *moghulensis*, Chr., *maculatus* var. *willmori*, James, *maculipalpis* var. *splendidus*, Koidz. (*indiensis*, Theo.), *smithi*, Theo., *subpictus*, Grassi, *pulcherrimus*, Theo., *marshalli*, Theo., *maculatus*, Theo., *longipalpis*, Theo., *jeyporiensis*, James, *gambiae*, Giles, *annularis*, Wulp (*fuliginosus*, Giles), *culicifacies*, Giles, *aconitus*, Dön., *vagus*, Dön., *albimanus*, Wied., *tarsimaculatus*, Goeldi, *plumbeus* var. *barianensis*, James, *gigas* var. *simlensis*, James & List., *hyrcanus* var. *nigerrimus*, Giles, *grabhami*, Theo., *lindesayi*, Giles, and *apicimacula*, D. & K., with additional notes on the pupa of *nili*, Theo. [*loc. cit.*]. A key divided into *Anopheles*, *Myzomyia*, *Chagasia* and *Nyssorhynchus* is given to the species in both papers, and also includes others of which the pupae have already been described, *viz.*, *Anopheles albitarsis* var. *brasiliensis*, Chagas, *A. argyritarsis*, R.-D., *A. darlingi*, Root, *A. strodei*, Root, *A. tarsimaculatus*, Goeldi [xiv, 197] and *A. argenteolobatus*, Gough [xvii, 128], and *Chagasia* (*Anopheles*) *fajardoi*, Lutz, and *C.* (*A.*) *bonneae*, Root [xv, 228 ; but *cf.* xix, 187]. The status of several species and varieties is discussed on the basis of pupal characters. These considerations confirm the view that *A. plumbeus* var. *barianensis* is not a distinct species.

At the beginning of the third paper, the author compares a number of pupae of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.), *hyrcanus*, Pall., *mauritianus*, Grp., *barbirostris*, Wulp, *lindesayi*, *funestus*, Giles, *sergenti*, Theo., *hispaniola*, Theo., and *marteri*, Sen. & Prun., to determine to what extent the characters of specimens from different localities agree with those used in the key, and concludes that in the case of *A. mauritianus* there are, in addition to the type, a form from the Belgian Congo, var. *paludis*, Theo., and a form from Jinja, Uganda [var. *ziemanni*, Grünb., *cf.* xx, 279], and in the case of *A. funestus* there are two forms, one from the Gold Coast and one from Sierra Leone. A much more detailed comparison is also made of a number of pupae of *A. vagus* and *A. maculipennis*, and it is concluded that in the latter the characters attributed to this species in the first paper are verified, but in the former owing to their variations, the dorsal hairs cannot be used as a reliable means of identification. Descriptions are given of the pupae of *A. karwari*, James, *symesi*, Edw., *aitkeni*, James, and *philippinensis*, Ludl., with notes on the chaetotaxy of *moucheti*, Evans [xviii, 52], and a diagram of specimens of *funestus* from Freetown for comparison with that of specimens from the Gold Coast given in the first paper. A key is given to all the species mentioned in the three papers, and this also includes others of which the pupae have already been described, *viz.*, *A. hargreavesi*, Evans, *freetownensis*, Evans [xviii, 52], *nimbus*, Theo., *minor*, Costa Lima, and *peryassui*, D. & K. [xix, 29].

Dreyfuss (A.). **Contribution à l'étude du paludisme dans la région des Hauts-Plateaux algériens. Le paludisme à Géryville en 1930.**—*Arch. Inst. Pasteur Algérie*, ix, no. 2, pp. 352–373, 7 pls., 1 map, 1 ref. Algiers, 1931. [Recd. November 1932.]

An account is given of an epidemic of malaria that occurred in 1930 at a station at an altitude of about 4,300 ft. where there had been no serious outbreak since 1904 and from which indigenous infection was believed to have disappeared. *Anopheles hispaniola*, Theo., and *A. maculipennis*, Mg., have both been recorded from this locality. Suitable breeding-places are found in the grassy pools left in a river bed and at the edges of a lake by the shrinkage of the water surface during the summer, and in the ponds usually found on the banks of the river bed. *Phlebotomus papatasii*, Scop., and *P. sergenti*, Parrot, have been taken at this station.

Rousse (—). **Notes de géographie médicale sur Tabelbala.**—*Arch. Inst. Pasteur Algérie*, ix, no. 2, pp. 382–398, 7 pls., 1 map, 3 refs. Algiers, 1931. [Recd. November 1932.]

A brief section of this paper is devoted to malaria, which is of common occurrence in the oasis of Tabelbala. *Anopheles sergenti*, Theo., has been found, and its possible breeding-places are discussed. Among the other insects recorded is *Phlebotomus papatasii*, Scop.

Parrot (L.), Donatien (A.) & Lestoquard (F.). **Observations nouvelles sur le développement du parasite de la leishmaniose viscérale du chien chez un phlébotome** (*Phlebotomus perniciosus*).—*Arch. Inst. Pasteur Algérie*, ix, no. 3, pp. 438–441, 3 refs. Algiers, 1931. [Recd. November 1932.]

An account is given of further experiments in Algeria in which *Phlebotomus perniciosus*, Newst., was fed on a dog infected with visceral leishmaniasis and showing secondary lesions in the skin [*cf. R.A.E.*, B, xviii, 268]. Of 58 individuals dissected 2–5 days later, 14 were found to be infected. Except in one case, the flagellates were always numerous. From the third day they were particularly abundant in the anterior portion of the mid-gut. In one female dissected on the third day and two on the fourth, they obstructed this portion below the junction of the oesophageal diverticulum. They were more rare in the posterior part of the mid-gut and in the blood not yet evacuated and absent from the hind-gut beyond the malpighian tubes and the pharynx. In a female dissected on the fifth day, in which the digestive tract no longer contained blood, flagellates were observed throughout the mid-gut, but were most numerous in the anterior portion. The tendency of the parasite of canine visceral leishmaniasis to invade the upper portions of the digestive tract and to avoid the lower agrees with what is known of the evolution of other species of *Leishmania* in sandflies. The course of development of the parasite within the sandfly is described.

Parrot (L.). **Observations biologiques sur** *Phlebotomus papatasi* **(Scop.)**.—*Arch. Inst. Pasteur Algérie*, ix, no. 3, pp. 442–450, 23 refs. Algiers, 1931. [Recd. November 1932.]

Breeding of *Phlebotomus papatasii*, Scop., has been carried out in Algeria every year since 1926 [*cf. R.A.E.*, B, xvi, 151]. Various

observations on the biology of this sandfly are discussed. A suitable degree of humidity is of great importance, particularly at the time of hatching and during the following week, and it is pointed out that if the nutritive medium is raised about 2 ins. and moistened from below by capillarity, the larvae will rise or descend in it to find the most favourable zone. The rearing medium employed was garden soil heated to 65–70°C. [149–158°F.] and mixed with dried pig's blood in the proportion of about 10 to 1 [*cf.* xv, 132]. Rabbit or lizard dung or pure vegetable mould was also used with satisfactory results, from which it appears that a small amount of organic material of either animal or vegetable origin is sufficient to ensure the regular development of the larvae. Temperature influences the rate of development of the sandfly, but at a constant temperature the length of the life-cycle varies greatly with the individual, being in some cases almost twice as long as in others.

In experiments on the possibility of hereditary transmission of *Leishmania tropica*, dissections of 14 larvae and 18 females of *P. papatasii*, bred from sandflies fed on white mice infected with oriental sore, gave negative results.

Laboratory bred individuals of *P. papatasii* were fed on a gecko [*Tarentola*] found naturally infected with *Leishmania tarentolae* in a district where no cases of human cutaneous or visceral leishmaniasis have been recorded for the past 25 years. Out of 13 sandflies, 12 engorged, but dissections made up to the sixth day after feeding revealed no parasites. It is concluded that *P. papatasii* is probably not a favourable host for *L. tarentolae*.

Dupuy d'Uby (P.). **A propos d'un nouveau cas de myiase oculaire à** *Oestrus ovis* **observé à Alger.**—*Arch. Inst. Pasteur Algérie,* ix, no. 4, pp. 630–637, 1 fig., 9 refs.

Trabut (G.). **Un cas de myiase oculaire à** *Oestrus ovis* **à Alger.**—*T.c.*, p. 638. Algiers, 1931. [Recd. November 1932.]

Accounts are given of three cases of infestation of the eye of man by larvae of *Oestrus ovis*, L., in Algiers. In the first paper the manner of infestation, and the symptoms, diagnosis and treatment are discussed, and previous records of such infestations are briefly mentioned [*R.A.E.*, B, i, 193].

Sergent (Et.). **Epidémies de paludisme en Algérie.**—*Arch. Inst. Pasteur Algérie,* x, no. 1, pp. 22–33, 13 graphs, 7 refs. Algiers, 1932.

From a study of the incidence of malaria and its relation to rainfall and other meteorological conditions in Algeria from 1902 to 1930, the author concludes that the most important factor associated with the periodically increased prevalence of the disease is the extent of the water surface existing at the beginning of the summer [*cf. R.A.E.*, B, xii, 179]. Even this does not account for every variation. The study of other meteorological phenomena, such as temperature, atmospheric pressure, sun spots, etc., does not provide a satisfactory explanation, and there are therefore unknown factors. The severe outbreaks between 1902 and 1930 occurred at intervals of approximately 12 years. Outbreaks may be foreseen by the amount of winter and spring rainfall, but sometimes only at the last moment.

SERGENT (Et.), CATANEI (A.), TRENSZ (F.) & SERGENT (A.). **Expérience de destruction des anophèles au moyen des gambouses dans un barrage-réservoir algérien.**—*Arch. Inst. Pasteur Algérie*, x, no. 2, pp. 153–156, 5 pls., 1 graph. Algiers, 1932.

An account is given of an experiment carried out in Algeria on the establishment of *Gambusia* [*holbrooki*] in a reservoir for the control of Anopheline larvae. The reservoir was filled during the third week in April ; several hundreds of fish were released at once, and 200–300 during each succeeding week until July. Culicine larvae and pupae, which were first observed about 4th May, were abundant by the 21st, and on the 26th the first Anopheline larvae appeared. At this time the fish were not sufficiently numerous to be effective, and on 27th May part of the edge was oiled to check the mosquito breeding. By 30th May all the Anopheline larvae had disappeared, but Culicine larvae were still present, and the banks that had been oiled were therefore cleared of vegetation. *Gambusia* became more and more numerous, and by 18th June the mosquito larvae had disappeared.

SERGENT (Et.). **Essai de peuplement d'une rivière d'Algérie (La Réghaia) par les gambouses.**—*Arch. Inst. Pasteur Algérie*, x, no. 3, pp. 348–355, 7 pls., 5 figs., 2 refs. Algiers, 1932.

An account is given of an experiment carried out in Algeria from 1929 to 1931 on the establishment of *Gambusia holbrooki* in a stream for the control of Anopheline larvae. Batches of fish were released at frequent intervals at various points. It is concluded that in parts of the stream where the bed is narrow and the current during the winter floods is swift, it is necessary to re-stock with *Gambusia* each spring, but in the wider parts the winter floods do not prevent its breeding, and it may spread for considerable distances from the point of release. The presence of larger fish did not appear to check the multiplication of *Gambusia*, and where it was sufficiently numerous, it entirely prevented the breeding of Anophelines in spite of the presence of filamentous green algae, which in some places formed a thick mat.

SERGENT (Et.). **Sur l'utilisation du vert de Paris comme larvicide en Algérie.**—*Arch. Inst. Pasteur Algérie*, x, no. 3, pp. 356–358. Algiers, 1932.

For two years experiments have been carried out in Algeria to compare Paris green and kerosene as mosquito larvicides in the more usual types of Anopheline breeding-places, from which the author concludes that dusting is of less practical value than oiling. The Paris green was mixed with fine sand or dust (1 : 50) and distributed by hand at the rate of about 50 gm. of the mixture to 1 sq. m. of water surface [about $1\frac{1}{2}$ oz. per sq. yd.]. For breeding-places where vegetation was present larger amounts were necessary. Paris green has the advantage of not affecting the quality of the water on which it is distributed, and its use is indicated on water used for spraying market garden crops, but Anopheline pupae are not killed by it as they are by kerosene, and it must therefore be applied more frequently than oil. A suitable diluent is not always available, and dusting cannot be carried out in a high wind or during rain. Moreover, it is more difficult to dust a breeding-place hidden by a thicket than to oil it. The total costs of dusting and oiling are approximately the same.

Sergent (Et.), Catanei (A.) & Senevet (G.). **Monographies des localitiés dénoncées comme palustres en Algérie. Etude épidémiologique et prophylactique du paludisme en 1926–27–28–29–30–31.**—*Arch. Inst. Pasteur Algérie*, x, no. 3, pp. 359–402, 3 pls., 2 figs., 3 maps. Algiers, 1932.

These brief accounts of the malarial situations in the localities in Algeria said to be infected include notes on Anopheline breeding-places with recommendations for anti-malarial measures suitable to each locality.

Sergent (Et.). **A propos de l'instinct de** *Culex pipiens*.—*Arch. Inst. Pasteur Algérie*, x, no. 3, pp. 403–406, 2 refs. Algiers, 1932.

Legendre [*R.A.E.*, B, xvii, 18] has observed that *Culex pipiens*, L., can delay oviposition if water is not present, and that egg rafts were absent from a tub in which there was a very small amount of water, but appeared as soon as more water was added. The experiments here described, however, afforded no evidence that the female instinctively chooses for the deposition of eggs water that is deep enough to last for the duration of the immature stages, eggs being laid much more often in shallow water likely to disappear in 48 hours.

Parrot (L.). **Nouvelles observations sur la biologie de** *Phlebotomus papatasi* (**Scop.**).—*Arch. Inst. Pasteur Algérie*, x, no. 3, pp. 407–409, 1 pl., 1 ref. Algiers, 1932.

It is known that larvae of *Phlebotomus* feed on organic detritus that is not in a state of active putrefaction, but in the laboratory at Algiers the author has observed that larvae of *P. papatasii*, Scop., in all stages of development, feed avidly on purely vegetable débris such as the dry, fallen leaves of elm or plane without the addition of any nitrogenous material of animal origin [*cf. R.A.E.*, B, xxi, 19]. The young larvae feed on one surface of the leaves only but those in the third and fourth stages devour everything but the veins. From the readiness with which the leaves are eaten, there is no doubt that in nature they are the ordinary basis of nourishment, and this apparently explains the habitual abundance of *P. papatasii* and other sandflies in the vicinity of gardens, parks and wooded places far from human habitations. Green leaves are not attacked. From these observations, it would appear necessary to amend certain urban control measures that aim at preventing the breeding of sandflies by the destruction of the nitrogenous matter previously considered necessary for the growth of the larvae. By using exclusively the leaves of elm, rose, fig or plane, placed either whole or in fragments at the bottom of porous pots, larvae have been reared to maturity and the proportion of eggs hatching has been higher than in the other media usually employed.

Further experiments on the influence of temperature on the length of the life-cycle of *P. papatasii* [*loc. cit.*] are described in which eggs of females taken in September 1931 and the resulting larvae and pupae were kept at different temperatures for different lengths of time. In two batches kept at a more or less low temperature for 7 months, the average duration of the life-cycle was 241 days ; this corresponds to the life-cycle under natural conditions during the cold season, for the adults from eggs laid in September appear at the end of April or beginning of May.

Harris (R. H. T. P.). **Some Facts and Figures regarding the attempted Control of** *Glossina pallidipes* **in Zululand.**—*S. Afr. J. Sci.*, xxix, pp. 495–507, 1 map, 6 refs. Johannesburg, October 1932.

An account is given of the work on the control of *Glossina pallidipes*, Aust., in the region of the Umfolozi Game Reserve in Zululand. From May 1929 to November 1930 this consisted in the organised destruction of large numbers of game in the buffer areas at the edges of the Reserve [*cf.* *R.A.E.*, B, xix, 14], and from 1931 onwards in investigations on the possibilities of trapping [*cf.* xix, 14, 78]. More than 1,000 traps were erected in the Reserve, and tables are given showing the numbers of the flies caught. The maximum number in any one month was 2,088,508 flies taken in 983 traps in September 1931. In one valley flies were so numerous from June to August 1931 that in one trap alone 6,955 were taken in June and 5,000 in August and in another trap in the same valley a record catch of 7,300 was taken in August.

It is concluded that where economical and scientific control of the fly by trapping is to be undertaken, it is advantageous to establish game sanctuaries to concentrate both game and fly. The number of such sanctuaries must be small, the number of game animals in them must be well within the limit that they can carry, and the game must be strictly confined within them.

It was found during the operations described that by concentrating the animals in a given area, the flies become concentrated with their food, that the presence of animals among the traps greatly increases the number of flies caught, and that by means of the traps the fly population can be definitely and rapidly reduced at a relatively low cost. The rate of reduction depends on the density of the fly, the number of traps and their disposition. Concentration of animals can only be carried out satisfactorily by an efficient organisation and cannot be brought about by indiscriminate free shooting. Most flies are to be found where the floral surroundings are most favourable to them and to the animals on which they feed ; traps among certain types of vegetation gave higher returns than elsewhere, and it is therefore considered important to study and make use of the plant conditions of the habitat of the fly.

Dicke (B. H.). **The Tsetse-fly's Influence on South African History.**—*S. Afr. J. Sci.*, xxix, pp. 792–796. Johannesburg, October 1932.

In this brief account of the influence of *Glossina* on the history of South Africa, the author suggests that the fly may have been the cause of the disappearance of foreign invaders known to have been present before 1500 A.D., and discusses the effect of the fly on native migrations up to about 1835 and on the movements of white settlers after that date.

Puri (I. M.). **Studies on Indian Simuliidae. Part IV. Descriptions of two new Species from North-east India,** *Simulium howletti* **sp. n. and** *Simulium hirtipannus* **sp. n., with a Note on** *S. ornatum* **Meigen. Part V. Species and Varieties of the** *striatum* **Series.**—*Ind. J. Med. Res.*, xx, no. 2, pp. 504–514, 2 pls., 4 refs., pp. 515–532, 1 pl., 5 refs. Calcutta, October 1932.

The species dealt with in the second paper are the six closely related forms allied to *Simulium striatum* hitherto collected from India. The

male and pupa of *S. striatum*, Brun., and the female and pupa of *S. grisescens*, Brun. (with var. *palmatum*, n., which is distinguished on pupal characters) are described for the first time, and revised descriptions of the female of the former and the male of the latter are given. Males, females and pupae of the following are described: *Simulium lineothorax*, sp. n., *S. consimilis*, sp. n., and *S. pallidum*, sp. n.

IYENGAR (M. O. T.). **Filariasis in North Travancore.**—*Ind. J. Med. Res.*, xx, no. 2, pp. 671–672, 1 ref. Calcutta, October 1932.

The type of filarial infection occurring in two coastal areas in North Travancore has been found to differ from that observed in other parts of India. The microfilariae found in man, which are described, are entirely different from *Filaria* (*Wuchereria*) *bancrofti* and are in many ways similar to those of *F. malayi* [*R.A.E.*, B, xvi, 41]. Both types of filarial infection occur in Travancore, the microfilariae in urban areas being *F. bancrofti*, and those in the sandy coastal areas resembling *F. malayi*. In the former areas *Culex fatigans*, Wied., is common and acts as an efficient intermediate host both in nature and under experimental conditions; in the latter this species is scarce and has not been found to be infected. Examinations following infection experiments in which laboratory bred *C. fatigans* fed on human carriers in one of the coastal areas failed to show any developmental phases of the microfilariae. On the other hand *Mansonia* (*Mansonioides*) *annulifera*, Theo., which is common in both coastal areas, was found to have a natural infection rate of 26 per cent. in an examination of 900 specimens, and laboratory bred females fed on human carriers readily acquired infection. The filaria larvae developed rapidly and reached the final proboscis stage in 11 days. *M. annulifera* appears to be the main vector of this infection.

PHILIP (C. B.), DAVIS (G. E.) & PARKER (R. R.). **Experimental Transmission of Tularaemia by Mosquitoes.**—*Publ. Hlth. Rep.*, xlvii, no. 43, pp. 2077–2088, 7 refs. Washington, D.C., 21st October 1932.

In order to determine the part played by mosquitos in the transmission of tularaemia, tests were carried out with seven species reared from larvae and pupae collected in the Bitter Root Valley, Montana, and *Aëdes aegypti*, L., from imported eggs. In all but one experiment the strain of *Bacterium tularense* used was one recovered in 1930 from a snowshoe rabbit in British Columbia [*R.A.E.*, B, xix, 92] and maintained in guineapigs. Mechanical transmission was shown to be occasionally possible, infection being transferred from infected to healthy guineapigs by interrupted feeding of *A. aegypti* in one instance, and twice by crushing single individuals on the unbroken skin of guineapigs 24 hours and 9 days respectively after the infecting feed. Viable organisms were recovered after varying periods by the injection of killed emulsified mosquitos into healthy guineapigs. In the case of *Theobaldia incidens*, Thomson, which appeared to be the most favourable of the species tested for the retention of infection, viable organisms were recovered up to the death of the mosquitos (a period of 35 days), and in dead specimens 4 days later, or 39 days after the original infecting blood meal. Duration of recoverable infection was variable in the same species. Transmission by the bites of mosquitos, 4–15 days after the infecting feeds, was not accomplished.

Excrement of *Aëdes vexans*, Mg., passed 24 hours after infecting blood meals, and of *A. aegypti* 3 and 4 days after such meals, was found to be infectious, although other tests at 2–9 days were negative. Injection of eggs from infected *A. aegypti* also gave negative results. One of four attempts to recover the infection by injection of males of *A. aegypti* previously confined with infected females was successful.

From these results, it appears that mosquitos that have fed on an animal suffering from tularaemia may infect man mechanically in the following ways: by biting after having been interrupted during their meal on the infected animal; by being crushed on the skin with or without subsequent rubbing; and by deposition of excrement on the skin. In nature, however, the occurrence of infection in this manner is not likely to occur at all commonly.

EDWARDS (F. W.). *Anopheles algeriensis* **Theobald (Diptera, Culicidae) in Norfolk.**—*J. Ent. Soc. S. Eng.*, i, no. 2, pp. 25–27. Southampton, 23rd November 1932.

Anopheles maculipennis, Mg., *A. claviger*, Mg., and *A. plumbeus*, Steph., were the only species of the genus known in Britain or northern Europe until *A. algeriensis*, Theo., was found by the author in three localities in the east of England (Norfolk) in August 1932 [but *cf. R.A.E.*, B, xx, 3]. Females fed readily in the open in calm dull weather or in sheltered spots at dusk and dawn, the bite being scarcely perceptible. None could be found in buildings. They oviposited 10 days after the first blood-meal. Males were abundant among thick sedge in the late afternoon, and were observed flying low over sedge just after sunset. When resting on a vertical surface, the body of this species is held practically parallel with the surface instead of at a distinct angle. Larvae were fairly numerous in the shallowest parts of extensive but shallow puddles among thick sedge. In two places *A. algeriensis* was much more numerous than *A. claviger*, which it resembles superficially; the more obvious distinguishing features of the various stages are briefly noted.

G. Senevet informed the author that *A. algeriensis* is rather scarce in Algeria and that larvae have been found in open sunny ditches in association with *A. maculipennis*. He suggests that the hot weather during the summer of 1932 may have been specially favourable to its breeding in England. It is not known whether it has been recently introduced into Norfolk (possibly by aeroplane), or whether, as is considered more probable, it is a widely distributed indigenous species that has been overlooked owing to confusion with *A. claviger*.

MACKERRAS (I. M.). **The Taxonomy of** *Lyperosia exigua* **de Meijere (Diptera, Muscidae).**—*Ann. Mag. Nat. Hist.*, (10) xi, no. 61, pp. 58–64, 11 refs. London, January, 1933.

In this paper the author disagrees with Malloch [*R.A.E.*, B, xx, 165] as to the status and scope of *Haematobia*, Lep. de St. F. & Serv. (1828). He does not agree that *Conops irritans*, L., was designated as the type by Westwood, as there is evidence that the insect that that author considered to be *irritans* was *Stomoxys stimulans*, Mg. (*irritans*, F. nec L.). Moreover he gave the genus as *Haematobia*, R.-D., which may be disregarded as a homonym. The author therefore considers that the type of *Haematobia* was first designated by Bezzi, who selected *stimulans*. This involves the application of the name *Haematobia* to

the group that includes *stimulans*, and which Malloch calls *Bdellolarynx*, and *Lyperosia* to the group of which *irritans* is the type, and which Malloch calls *Haematobia*. As a result of this the following changes in Malloch's subgenera are necessary : *Haematobia* becomes *Lyperosia*, *Lyperosiops* becomes *Haematobia*, and *Bdellolarynx* and *Haematobina* become subgenera of *Haematobia*.

The fly described by Malloch as *Haematobia australis* is that considered by Australian entomologists to be *Lyperosia exigua*, de Meij. In order to ascertain if this identification was correct, the author examined a long series, including several hundred specimens from Java (the type locality of *exigua*) and the Lesser Sunda Islands and from Australia, as well as a small series from the Andaman Islands, and found that the characters separating *australis* from *exigua* did not hold good. Apart from morphological evidence that the same species occurs in Java and Australia, there is strong evidence for the belief that the fly was introduced into Australia. Its hosts there are buffalo, cattle and horses. Man is only occasionally attacked, and experiments have failed to induce it to feed on native mammals. The exclusive breeding-ground so far discovered in nature is the faeces of buffalo and cattle [*cf.* xix, 158]. The fly was almost certainly originally associated with the introduced buffalo and has spread with the movement of cattle throughout northern Australia [*cf.* xx, 46, etc.]. The distribution of *L. exigua* is fully recorded, and the characters distinguishing it from *L. irritans* are given.

DAVIES (W. M.) & JONES (E.). **Extension Work on the Control of Warble Flies.**—*J. Minist. Agric.*, xxxix, no. 9, pp. 805–813, 5 refs. London, December 1932.

An account is given of experiments undertaken to ascertain whether any appreciable reduction in infestation with warble-flies [*Hypoderma*] could be obtained by treatment of cattle on a large scale with derris powder wash [*R.A.E.*, B, xviii, 204, etc.]. The work was carried out in four areas in Wales selected to represent different types of cattle-farming districts. Before treatment, over 90 per cent. of the cattle were infested, the average number of warbles on each animal varying in the different districts from 11 to 16. In the year following treatment (in one area two years after), the infestation was reduced to 15–24 per cent., and the average number of warbles was 0·5–1·1 per animal. Untreated cattle near the border of the treated areas served as controls and showed that 90 per cent. were still infested, the average number of warbles varying from 11 to 12 per animal.

These results appear to be largely influenced by the fact that the flies show little tendency to migrate from one area to another. This habit is discussed, and it is pointed out that for this reason many farmers, or small groups of farmers, owing to the topographical situations of their farms, could obtain considerable reduction in infestation, even if they alone treated their cattle. Experiments carried out to test the toxicity of derris powder in the dry state (applied by rubbing it in by hand after the backs of the cattle had been brushed) showed that a high mortality can be obtained. It is not suggested that this treatment should replace the wash, because, especially in the case of young, untied stock, the wash is more easily applied, but in cases where only a few cattle are to be treated, the dry powder might be used to avoid the trouble of preparing the wash. Moreover, the dry powder is of value in destroying lice on cattle.

In order to ascertain whether any appreciable reduction could be made in the cost of the treatment, experiments were undertaken to test Peruvian cubé root [*Lonchocarpus nicou*], which has a much higher rotenone content than derris, using $\frac{1}{4}$ lb. per gal. of wash. At this strength over 95 per cent. mortality was obtained under experimental conditions but very variable results were obtained under ordinary farm conditions. This material was just as effective as derris when applied at the same rate, but at this strength there is no reduction in cost.

BONNE-WEPSTER (J.). **Over symbiose tusschen muskieten-larven en waterplanten.** [On Symbiosis between Mosquito Larvae and aquatic Plants.] —*Tijdschr. Ent.*, lxxv, Suppl., pp. 254–258, 8 figs. Amsterdam, 1932.

This is a survey of records of larvae of *Mansonia* (*Taeniorhynchus*) breathing by insertion of the syphon into the tissues of aquatic plants and thus obtaining oxygen through their roots. Recently the author has found *Ficalbia hybrida*, Leic., in Java breathing in this manner [*R.A.E.*, B, xx, 108]. Investigation is necessary to ascertain whether all species of *Mansonia* live in symbiosis with aquatic plants or whether differences in this respect occur as in *Ficalbia*.

DE BUEN (E.). **Algunos datos sobre biologia del** ***Anopheles maculipennis*** (*claviger*) **en su fase de adulto.** [Some Data on the Biology of *A. maculipennis* in its adult Stage.]—*Med. Países cálidos*, v, no. 6, pp. 449–485, 2 figs., 8 diag., 74 refs. Madrid, November 1932.

This paper on *Anopheles maculipennis*, Mg., supplements one on its immature stages [*R.A.E.*, B, xix, 3]. The results obtained by the author in Spain are compared with data from the literature. Night was the chief time of adult emergence from the pupa, the evening coming next. Adults were found throughout the year in animal quarters and, less abundantly, in sheltered positions in the open and in dwellings, chiefly in bedrooms. In spring, oviposition took place in any water reached by sunlight [*cf. loc. cit.*], but in summer, eggs were laid only in those that had remained comparatively clean. Two peaks in abundance were noticed, namely in May–July and in October–November. Males disappeared during the period from early December to mid-March. Hibernation began about mid-October and lasted until about mid-March, but was not complete, as females containing blood were found throughout the year, as were also females with matured eggs. Animal quarters are preferred for egg maturation, the females in them leaving chiefly in order to oviposit, whereas those in dwellings do so mainly to feed or to be fertilised. The mosquitos were least numerous in dwellings during the cold weather, from November to April, but were then very abundant in animal quarters.

GALLIARD (H.). **Culicidés du Gabon. IV. Essai sur leur biologie dans ses rapports avec le paludisme local.**—*Ann. Parasit. hum. comp.*, x, no. 6, pp. 465–493, 8 pls., 1 map, 3 pp. refs. Paris, 1st November 1932.

A survey of the mosquitos of western Gabun was undertaken from May to November 1930 ; a brief account of the results has already been noticed [*R.A.E.*, B, xx, 63]. Details are given of the breeding-places

of the larvae and habits of the adults of *Anopheles mauritianus*, Grp., *A. gambiae*, Giles, and *A. funestus*, Giles, the three commonest Anophelines, together with an account of their seasonal incidence. In each case, the literature on the particular species in other parts of Africa is briefly reviewed. A list is given of the mosquitos recorded [*cf.* xx, 87, 98].

A. mauritianus, which probably takes no part in the transmission of malaria, is the most widely distributed species, and has been found on the coast and in the forest and savannah regions of the interior. The larvae occur in running or stagnant water, unshaded or shaded, in holes in rocks, in grassy marshes or among Confervaceae with *A. funestus*, or in water apparently without vegetation in association with larvae of *Culex*. *A. gambiae* is abundant on the coast, but was not observed in the dry season (May-September) except in the larval stage in the savannah region of the interior. *A. funestus* was almost entirely absent on the coast, but in the dry season larvae were often found in the savannah areas, where breeding-places were numerous and varied.

In the dry season, the adults disappear from houses and reproduction is retarded. Oviposition seems to be more directly influenced by sudden variations in temperature in the case of *A. gambiae* and *A. funestus* than in that of *A. mauritianus*. In the first two species the larval stage lasts 17 days, and in the last 25–30. At the beginning of the rains, the adults are found in houses at night only and then very irregularly. They are found rather more frequently at the end of the rains, but, except for an occasional individual of *A. mauritianus*, they are not seen during the day and are rarely found outside.

DE BOISSEZON (P.). **L'hibernation conditionelle chez** *Theobaldia annulata* **Schr.**—*Ann. Parasit. hum. comp.*, x, no. 6, pp. 494–496, 1 ref. Paris, 1st November 1932.

Observations made on a single female of *Theobaldia annulata*, Schr., in the neighbourhood of Toulouse, indicate that hibernating individuals may resume activity, feed and lay eggs when maintained at medium temperatures. Thus hibernation in this species is a conditional phenomenon determined by cold.

RAYNAL (J.) & LE GAC (P.). **Sur la présence de** *Phlebotomus papatasi* **Scopoli 1786 à Marseille.**—*Ann. Parasit. hum. comp.*, x, no. 6, pp. 497–503, 3 figs., 1 ref. Paris, 1st November 1932.

RAYNAL (J.) & LE GAC (P.). **Sur un exemplaire de** *Phlebotomus larroussei* **Langeron et Nitzulescu 1931, capturé à La Rose (Banlieue de Marseille).**—*T.c.*, pp. 504–508, 2 figs., 1 ref.

Notes are given on the principal anatomical characters of both sexes of *Phlebotomus papatasii*, Scop., and of a female of *P. larroussei*, Lang. & Nitz., all of which were taken at Marseilles.

LESTER (H. M. O.). **Report of the Tsetse Investigation.**—*Rep. Med. Hlth. Dept. Nigeria 1931*, pp. 89–98. Lagos, 1932.

Brief reference is made to work on the transmissibility of strains of *Trypanosoma gambiense* by *Glossina tachinoides*, Westw., and the effect of temperature on the infection rate [*R.A.E.*, B, xx, 275], and also to

attempts to devise traps for *G. tachinoides* and *G. morsitans*, Westw., on the principle of that used for *G. pallidipes*, Aust., in Zululand [xix, 78]. The results obtained with these traps have not been satisfactory, and it appears doubtful whether the use on a large scale of any kind of trap is practicable in Nigeria.

JACK (R. W.). **Tsetse Fly Operations in Lomagundi District (Umboe and Sipolilo Areas).**—*Rhod. Agric. J.*, xxix, no. 11, pp. 886–905, 2 maps. Salisbury, Rhodesia, November 1932.

An account is given of the work of game elimination for the control of *Glossina morsitans*, Westw., that has been carried out in the fenced buffer zone of the Lomagundi (Umboe) District of Southern Rhodesia since 1925 [*cf. R.A.E.*, B, xiv, 97 ; xvi, 15, 257 ; xvii, 211 ; xviii, 217 ; xix, 178]. The advance of the fly ceased at the beginning of the operations and showed definite signs of retrogression from 1927 onwards. At the present time the limit of the definitely infested territory has receded for 15–20 miles, and the fly in measurable density is confined to a narrow strip of country immediately south of the northernmost fence, where its continued presence is almost certainly due to an overflow from outside. The fenced area, which is roughly 500 square miles in extent, is now practically free from the larger species of game. The presence of considerable numbers of baboons has not prevented the disappearance of the fly, and it is possible that they (and also monkeys) catch and destroy a considerable proportion of the flies that attempt to feed on them. During these operations, no evidence has been obtained to support the theory that the destruction of game causes the fly to feed in increasing numbers on man.

Trypanosomiasis of cattle has greatly decreased in the occupied area and is now confined to occasional outbreaks on isolated farms. Experience has shown that these sporadic outbreaks may occur at long distances from definite fly-infested areas ; that they do not represent new foci of infestation is generally demonstrated by their temporary character. In many places they cannot be attributed to carriage of the fly by man, game or vehicles and appear to be due to its spontaneous ranging.

Intensive hunting probably not only reduces the food-supply of the fly, but effects changes in the habits of the game animals that tend to break up their association with it. They become timid and retire to the hills or other retreats away from the fly during the day, coming down to the lower levels at night, when it is generally inactive. It is known that the fly requires comparatively frequent meals to maintain both life and breeding activity, and under conditions that lead to irregular and only occasional meals it is evident that its numbers tend to diminish. There are no indications that it migrates from disturbed areas, although there are indications that it tends to range further afield for a period, possibly in search of food. It has been suggested that though the reduction of game may result in the diminution of the fly, it will not result in actual extermination. The author considers this argument to be unsound and points out that the vital factor is not the quantity of blood present but the frequency of opportunities to feed, and that if the game and fly are largely dissociated, a small number of flies has no more opportunities of feeding than a large one. Thus the maintenance of conditions under which the fly is decreasing from lack of sustenance should theoretically result in its ultimate annihilation.

The flies follow moving animals for limited distances during the day, but do not maintain indefinite contact with herds of game and follow them in their wanderings. If they did, there could apparently be no such phenomenon as definite fly belts. In general, they are dependent upon finding a fresh source of food for each meal, and also appear to be largely dependent upon animals penetrating into their particular habitat. The apparently complete disappearance of resident flies from the whole of the first fenced zone and from a large portion of the second in the Lomagundi area indicates that elimination is not only possible through extensive hunting of game, but that it is the natural sequence of events if the operations are sufficiently maintained.

Effect of Arsenite of Soda on Housefly Maggots.—*Fmg. S. Afr.*, 1932, reprint no. 38, 1 p. Pretoria, October 1932.

The breeding of house-flies [*Musca domestica,* L.] in night-soil beds presented a serious problem in the sanitary compound at Potchefstroom, Transvaal, particularly during the wet months from November to March when the soil remains moist and attractive for many days. Experiments were therefore undertaken in which amounts of sodium arsenite varying by ¼ lb. from ½ lb. to 1½ lb. were mixed with 100 gals. night-soil in the collecting carts. Where sodium arsenite was used at ½ lb. and ¾lb. per 100 gals., the larvae matured and pupated but no flies emerged, but with the arsenical at higher rates the larvae died before they reached maturity. The poison appears to act slowly, for at the rate of 1 lb. per 100 gals. it was toxic only after about 5–6 days. In plots in the open, large numbers of eggs were observed, showing that the poison does not affect their attractiveness. The results were similar to those in the experiments.

Cazanove (F.). **Les moustiques à Dakar en 1931.**—*Bull. Soc. Path. exot.*, xxv, no. 7, pp. 797–817. Paris, 1932.

The breeding-places of *Aëdes* (*Stegomyia*) [*aegypti*, L.], *Anopheles*, and *Culex* in Dakar and its environs in 1931 are discussed. In Senegal, outbreaks of yellow fever usually begin in September–October and in May–June, at the end and beginning of the hot season respectively. The epidemic in September can be explained by the abundance of the vector resulting from the large number of breeding-places created by the rains, and by its increased activity caused by continued high temperatures. Moreover, about this time the harvesting of ground-nuts is over and natives coming into Dakar to seek work may introduce the yellow fever virus from regions where the disease is endemic. About the middle of November, when the first cold winds from the north-west occur, the activity of the mosquito decreases, and the epidemic dies down. When, as in 1931, the rains of the hot season are not abundant, not only are the exterior breeding-places of *A. aegypti* less numerous, but the harvesting of the ground-nuts is delayed and the carriers of the virus do not arrive in Dakar until the cold winds have reduced the numbers of mosquitos. Under these circumstances, the chances of contracting yellow fever are greatly diminished. The epidemic that occurs in April–June, when *A. aegypti* is not numerous, is more difficult to explain, and although it is possible that infected mosquitos are transported by the railway, the author considers it more probable that there is a slow continuous invasion of Dakar by carriers of the virus.

Fourie (L.). **Report on Plague in Ovamboland, South West Africa.**—*Ann. Rep. Dept. Publ. Hlth. S. Afr. 1931–32*, pp. 58–80. Pretoria, 1932.

A detailed account is given of investigations from March to May 1932 on the prevalence of plague in rodents and man in Ovamboland, South West Africa. This includes notes on the distribution of small mammals that are known to be associated with the spread of plague, based on previous reports supplemented by the observations of the author. Only two species of fleas were collected by him, *Xenopsylla eridos*, Roths., on rodents, and *Echidnophaga gallinacea*, Westw., on cats and dogs. Fleas are seldom complained of in dwellings or outhouses in South West Africa, and few are found on domestic animals outside the native settlements. An epizootic apparently spread from the south northwards through the Kalahari during 1930 and 1931.

The use of kerosene emulsion against fleas is impracticable on the loose sand forming the floors of the shelters and of some of the huts, and ordinary fumigation of huts would require too much time. Experiments were therefore undertaken with calcium cyanide dust sprinkled in a thin layer over the floors, in the interstices at the foot of the walls, inside and outside, and in the yards in any corners and spaces not directly exposed to sunlight. Hydrocyanic acid gas is given off immediately after exposure to the air, and even in the open the concentration near the ground was sufficient to kill flies almost instantaneously. On rodents, the fleas are killed before their host. The gas is evidently given off in sufficient quantity to kill the fleas on the surface and possibly, through absorption, those in the sand also. In order to ensure the destruction of eggs, etc., the surface was lightly raked 5 minutes after sprinkling. Huts with stamped mud floors were treated with kerosene emulsion followed by fumigation, or by fumigation or sprinkled dust alone. Dust was pumped into all burrows in or near the kraal, clothes, bedding, etc., were fumigated or treated with kerosene emulsion, and vermin were removed from dogs and cats with kerosene emulsion.

Mathis (C.) & Advier (M.). **Considérations épidémiologiques sur la peste au Sénégal (à propos du Mémoire de G. Lefrou présenté à la séance du 8 juin 1932).**—*Bull. Soc. Path. exot.*, xxv, no. 9, pp. 941–944. Paris, 1932.

The authors consider that the facts do not justify the conclusion reached by Lefrou that the outbreak of plague that occurred in Saint-Louis, Senegal, in 1929 was due to transmission of the disease from man to man by fleas [*R.A.E.*, B, xx, 203]. Examination of smears from the spleens of 1,026 rats during the course of the epidemic revealed plague infection in 8 individuals. Although this rate appears small, rodents are so abundant that it may involve sufficient infected rats and fleas to start an epidemic. In Senegal, *Pulex irritans*, L., is rare, and *Synosternus pallidus*, Tasch., which is very abundant in huts, does not appear to transmit the disease with any ease [xix, 222]. If these facts are confirmed, the rat flea *Xenopsylla cheopis*, Roths., would appear to be the principal vector of plague recorded in man.

DELANOË (P.). **L'importance de la puce de l'homme,** *Pulex irritans* **L., dans les épidémies de peste au Maroc.**—*Bull. Soc. Path. exot.*, xxv, no. 9, pp. 958–960, 4 refs. Paris, 1932.

A study of an outbreak of bubonic plague in Morocco in 1929–30 showed that, as in a similar outbreak in 1911–12, rats and their fleas played little if any part in its dissemination, and *Pulex irritans*, L., which is extraordinarily abundant, is stated to have been the principal vector [*cf.* *R.A.E.*, B, xiii, 73].

DELANOË (P.). **Au sujet de la présence chez deux carnassiers du Maroc d'une variété de la puce de l'homme,** *Pulex irritans* **Linné variété** *fulvus* **Ioff 1929.**—*Bull. Soc. Path. exot.*, xxv, no. 9, pp. 960–962, 2 refs. Paris, 1932.

The author records the presence on jackals and foxes in Morocco of large numbers of fleas closely resembling *Pulex irritans*, L., which may be identical with var. *fulvus*, Ioff [*R.A.E.*, B, xviii, 118]. These fleas are of a more or less pale tawny colour (as compared with the jet black of *P. irritans*). Individuals from a jackal could only be induced with difficulty to feed on man, and none completely engorged, although they fed to repletion immediately when replaced on their original host. In the case of *P. irritans* found on man and pigs [xiii, 73], the hosts are only attacked in search of food, whereas the flea found on jackals and foxes lives in the fur and even lays its eggs on the hairs of the host.

WAGNER (J.) & ROUBAUD (E.). **Sur un pulicide nouveau parasite des rongeurs et insectivores de Madagascar (2e note).**—*Bull. Soc. Path. exot.*, xxv, no. 9, pp. 962–964, 2 pls., 1 ref. Paris, 1932.

The authors describe the female of *Synopsyllus fonquernii*, Wagn. & Roub. [*cf.* *R.A.E.*, B, xx, 147], both sexes of which were found in abundance on hedgehogs and *Centetes* in the region of Tananarive. It is rarely found on rodents, which seem to be infested chiefly during the period when these insectivora are hibernating.

TOUMANOFF (C.). **La transmission du paludisme au Tonkin en fonction de la physiographie des lieux (Note préliminaire).**—*Bull. Soc. Path. exot.*, xxv, no. 9, pp. 976–985. Paris, 1932.

The following is largely taken from the author's summary: Dissections of large numbers of Anophelines of various species were carried out in Tonkin during 18 months of 1931–32. *A. minimus*, Theo., *A. jeyporiensis*, James, *A. aconitus*, Dön., *A. maculatus*, Theo., and *A. vagus*, Dön., were found to contain parasites of malaria. *A. minimus*, which was most frequently infected in various types of country, in localities far removed from one another and during different months of the year, seems to be the most important vector in Tonkin. The percentage of infection in this mosquito increased from 0·8 in undulating country with irrigation canals and 1·2 in the region of wooded hills and marshy valleys to 3·43 in the wooded mountainous areas with numerous streams.

SERGENT (Ed.), DONATIEN (A.), PARROT (L.) & LESTOQUARD (F.). **Suppression expérimentale de la reproduction sexuée chez un hématozoaire** *Theileria dispar*.—*C. R. Acad. Sci. Fr.*, cxcv, no. 23, pp. 1054–1056, 6 refs. Paris, 1932.

Experiments in Algeria showed that bovine piroplasmosis caused by *Theileria dispar*, when transmitted to a healthy animal by blood inoculation, loses its power of infecting *Hyalomma mauritanicum*, Senevet, irrespective of the strain used or of the length of time it has been preserved by progressive inoculations. Over 1,400 larvae of the tick placed on calves infected by blood inoculation and transferred as adults to healthy animals failed to transmit the infection, whereas larvae from calves infected naturally produced adults that transmitted it.

T. dispar, when transmitted by blood inoculation, is perpetuated by schizogonic multiplication and sexual reproduction disappears, the practical consequence being that a strain can thus be obtained that can be used as a vaccine without creating dangerous reservoirs of the disease.

THEODOR (O.). **Ueber** *Ornithodorus coniceps* **Canestrini in Palästina.**—*Z. Parasitenk.*, v, no. 1, pp. 69–79, 7 figs., 3 refs. Berlin, 1932.

The Argasid ticks that occur in Palestine are *Argas persicus*, Oken, *Ornithodorus savignyi*, Aud., *O. lahorensis*, Neum., *O. papillipes*, Bir., and *O. coniceps*, Can. All stages of the last, which is a pest of fowls, are described, and an account is given of the results of observations on its bionomics. The eggs are laid at intervals over a period of 8 months in the cracks in huts, hen-houses, etc., in which the females hide by day, oviposition beginning 3–10 days after a feed. At 100 per cent. relative humidity they hatch in 5–45 days according to temperature. A temperature below 15°C. [59°F.] is fatal. The larvae rest for 2–3 days and then attach themselves to a fowl, this early feeding distinguishing them from those of other species of the genus, which feed for the first time as nymphs. About 6–8 days after feeding, the larvae moult and become nymphs. The second moult occurs 5 days later, and no food is taken between these moults. The nymphs of the second stage feed about 8 days after moulting. There are 4–5 nymphal stages, moulting occurring fairly regularly after each meal. Larvae hatching in spring mature in 7–8 months, but the development of those hatching in summer or autumn is prolonged to include the winter resting period. The larvae feed on any part of a fowl, but the nymphs and adults feed almost exclusively on the feet.

In Palestine this tick only occurs in the mountainous districts where spirochaetosis of fowls has not been recorded. Experiments indicated that it only occasionally transmits the disease and that the spirochaete loses its virulence in it.

POSPELOVA-STROM (M. W.). **Bobachtungen über die Biologie von** *Hyalomma yakimowi* **Ol. in Laboratoriumsbedingungen.** [Observations on the Biology of *H. yakimowi* under Laboratory Conditions.]—*Z. Parasitenk.*, v, no. 1, pp. 195–212, 6 refs. Berlin, 1932.

The author has bred 2 generations from 67 females of *Hyalomma yakimowi*, Ol., obtained in Turkmenistan from camels that had come from Persia, and records the results of observations on the development

of the tick under various conditions of temperature and moisture. It completed its development not only on two or three hosts, but also on hedgehogs only. The length of the stages depended more on the temperature of the host's body than on that of the atmosphere.

HOWARD (L. O.) & BISHOPP (F. C.). **Mosquito Remedies and Preventives.**—*Fmrs.' Bull. U. S. Dept. Agric.*, no. 1570, 11 pp. Washington, D.C., June 1932.

This further revision of a bulletin previously noticed [*R.A.E.*, B, vi, 69; xvii, 16] contains additional information on various anti-larval measures, including the use of borax (2 oz. per U.S. gal. water [*cf.* xvi, 142]) and of kerosene extract of pyrethrum [xix, 128] as larvicides.

MELVIN (R.). **Physiological Studies on the Effect of Flies and Fly Sprays on Cattle.**—*J. Econ. Ent.*, xxv, no. 6, pp. 1151–1164, 4 graphs, 2 refs. Geneva, N.Y., December 1932.

Extensive and detailed studies were carried out from June 1928 to October 1930 in Iowa and Texas to determine the effects of flies and fly-sprays on respiratory rate and body temperature of cows. The methods and materials used in these studies, which were designed to supplement previous ones [*R.A.E.*, B, xiv, 27; xvi, 227], are described. All the petroleum oil sprays studied caused a measurable rise in body temperature and respiratory rate of both heifers and cows under certain weather conditions. Both air temperature and intensity of sun influenced the rise of the body temperature of oil-sprayed animals, but the rise was not marked until the air temperature exceeded 80–85°F. The rise was greater in cows than in heifers. An almost non-volatile oil caused a greater rise in body temperature than any other of the oils studied. In oil-sprayed animals exposed to the direct rays of the sun there was a greater rise in the body temperature of the dark coloured ones. Body temperature readings and respiratory movement counts made at various intervals showed that the effects of oil sprays were still pronounced 8 days after application was discontinued when the air temperature was above 90°F.

Exposure to *Stomoxys calcitrans*, L., caused a measurable rise in body temperature and respiratory rates of both heifers and cows under certain weather conditions. When trapped flies were introduced at the rate of 500 to a cow soon after they were captured, the increase in body temperature amounted to 1°F., whereas if the flies were captured the day before, the difference was 2–5°F. If fasting flies were introduced early on cool days or at noon on hot days, no rise in temperature could be detected for a considerable period, indicating the effect of air temperature or some combination of weather conditions on the feeding activity of the flies. When weather conditions were favourable to feeding activity, the greatest rise in body temperature was found to occur 2 hours after the flies were introduced. No noticeable rise in body temperature was caused by the introduction of flies at the rate of 100 to a cow, whereas 200 flies caused a rise of from 0·2 to 0·6°F., and 300 flies one of from 0·4 to 1·0°F. In the case of *Musca domestica*, L., in tests conducted under a variety of weather conditions with as many as 15,000 flies to an animal there was in no case a difference greater than 0·5°F. between the body temperatures of fly-infested and fly-free animals.

Simmons (S. W.). **Surgical Maggots in the Treatment of infected Wounds : a convenient Blowfly Cage.**—*J. Econ. Ent.*, xxv, no. 6, pp. 1191–1193, 2 figs. Geneva, N.Y., December 1932.

A special type of breeding cage for blow-flies the larvae of which are used in the treatment of osteomyelitis [*R.A.E.*, B, xx, 125–129] is described. The framework consists of two disks of wood held together by perpendicular iron rods. A circular opening cut through the upper disk is closed with a piece of transparent sheet celluloid. A groove is cut around the edges of both top and bottom disks to hold rubber bands used in fastening on a cloth sack, which is made of some thin white transparent material, reinforced at the bottom, and having a sleeve at the side for the introduction of food. This sack covers the entire frame except the flat top. Flies can be transferred to a clean cage by inverting it over the dirty one, after removing the sheet of celluloid. This cage avoids the use of screen wire, on which blow-flies tend to break their wings.

Shull (W. E.). **Control of the Cattle Louse,** *Bovicola bovis* **Linn. (Mallophaga, Trichodectidae).**—*J. Econ. Ent.*, xxv, no. 6, pp. 1208–1211, 3 refs. Geneva, N.Y., December 1932.

All breeds of cattle are subject to infestation by *Bovicola bovis*, L., but those having an oily coat are less infested than those having a drier one. The lice may be found in large numbers during the winter on the top of the head and neck and on the shoulders, crop, hips, back and rump of the animal. When the hair begins to fall, they also occur on the lower part of the ribs and shoulders, but with the growth of new hair, the skin becomes more oily and the lice become less numerous. No eggs are found on the lower parts. None of the attempts made to determine the life-history was successful, but in a few of the cages used, which remained on the animal long enough for the eggs to hatch, the incubation period was found to be 9 days.

Tests in 1931 showed that sodium fluoride at the rate of 30 gm. to each animal and also a finely powdered inert dust (diatomaceous earth) are very effective in control. Commercially prepared insect powders were also effective, but their cost is somewhat higher. The diatomaceous earth is about 1½ times as heavy as the sodium fluoride, so that more is required per animal ; actually 90 gm. were used. Under northern climatic conditions a single treatment appears to be adequate, no lice being found on any of the test animals 14 days after one application. The dusts were applied from a shaker-top tin and rubbed into the hair by hand.

Hoskins (W. M.). **Toxicity and Permeability. I. The Toxicity of Acid and Basic Solutions of Sodium Arsenite to Mosquito Pupae.**—*J. Econ. Ent.*, xxv, no. 6, pp. 1212–1224, 3 graphs, 32 refs. Geneva, N.Y., December 1932.

The following is the author's abstract : The relative toxicity to mosquito pupae of dilute acid and basic solutions of sodium arsenite have been studied by determining the lengths of immersion required to cause 50 per cent. mortality. Over the range of concentration of 0·01 molal to 0·03 molal, the acidic solutions (pH 5) are approximately 4½ times as rapid in their toxic action as the basic solutions (pH 11). The results are discussed in terms of the adsorption mechanism of toxic

action, and it is suggested that adsorption is important chiefly because it is a step in the penetration of toxic substances. The greater toxicity of acidic solutions of sodium arsenite is attributed to the greater ease of penetration of tissues by the arsenious acid molecules of the acid solutions, as contrasted with the difficulty of penetration by the sodium arsenite ions of the basic solutions.

GNADINGER (C. B.) & CORL (C. S.). **The relative Toxicity of the Pyrethrins and Rotenone as Fly Spray Ingredients.**—*J. Econ. Ent.*, xxv, no. 6, pp. 1237–1240, 12 refs. Geneva, N.Y., December 1932.

Brief reference is made to the results obtained by other workers in respect of the comparative toxicity of the pyrethrins and rotenone, which have varied in relation to the different insects to which they have been applied, and experiments carried out to determine the value of rotenone as a constituent of fly sprays of the pyrethrum-mineral oil type are described. In view of the possibility of deterioration of pyrethrum extracts, isolated pyrethrins and pure rotenone were used in these tests. The isolated pyrethrins were dissolved in petroleum ether. Solutions of the pyrethrins and rotenone in highly refined mineral oil were prepared and their toxicity to *Musca domestica*, L., was determined by the Peet-Grady method [*R.A.E.*, A, xvi, 677], 5 per cent. acetone being added to the solutions on account of the low solubility of the rotenone. Allowance was also made for the petroleum ether, but neither acetone nor petroleum ether is toxic to flies at the concentrations used. The pyrethrin and rotenone content of the solutions, which were prepared about 3 days before the first tests and stored in corked bottles in the dark, were so adjusted as to yield approximately 50 per cent. kill.

The oil solution of rotenone was found to be considerably less toxic to *M. domestica* than the pyrethrin solution of the same concentration, and the addition of small amounts of rotenone to oil solutions of pyrethrins was found to increase the toxicity to a less extent than the addition of the same amount of pyrethrins.

FRYE (W. W.) & MELENEY (H. E.). **Investigations of *Endamoeba histolytica* and other intestinal Protozoa in Tenessee : IV. A Study of Flies, Rats, Mice and some domestic Animals as possible Carriers of the intestinal Protozoa of Man in a Rural Community.**—*Amer. J. Hyg.*, xvi, no. 3, pp. 729–749, 2 pls., 41 refs. Baltimore, Md., November 1932.

In the course of investigation on the reservoirs and methods of spread of *Endamoeba histolytica* in a rural community in Tennessee, where the incidence of infection is high (38 per cent.) though there is little evidence of the occurrence of clinical amoebic dysentery, observations were made on house-flies [*Musca domestica*, L.] collected by means of hand nets in and about 18 houses. Of 46 collections (comprising 7,948 flies), cysts characteristic of *E. histolytica* were found in 6, all of which were made inside houses. In no collection were cysts numerous, but in most more than one was observed. Flies are probably no more abundant than in other parts of the State where the incidence of *E. histolytica* is lower, but the results indicate that where its incidence is high and the deposition of human excrement promiscuous, flies may

help to maintain infection and to spread it from house to house. The literature dealing with flies as possible transmitting agents of the intestinal Protozoa of man is briefly reviewed.

Boyd (M. F.) & Cain, jr. (T. L.). **On Large Scale Rearing of *Anopheles quadrimaculatus* in Captivity.**—*Amer. J. Hyg.*, xvi, no. 3, pp. 832–835, 2 refs. Baltimore, Md., November 1932.

A description is given of a new method of rearing abundant supplies of *Anopheles quadrimaculatus*, Say, in captivity, by means of which 2,482 pupae and 2,020 adults were obtained from 2,832 larvae.

About 2–3 days prior to oviposition, white enamelled pans (about 12 ins. in diameter and 2½ ins. deep) about two-thirds full of pond water, on the surface of which is scattered a small handful of finely broken timothy hay, are placed in a large water-bath equipped with heating and cooling units thermostatically controlled to maintain a constant temperature of 70°F. To supplement the infusion as food for the larvae, three pieces of Fleischmann's yeast, each about the size of a pea, are placed on a glass slide, supported in the centre of the pan about ⅛ in. below the surface of the water. This level is maintained by the addition of water and the yeast is renewed daily ; a little broken hay may be added when necessary. Eggs are obtained from recently captured females caged above a bowl of water, and the newly hatched larvae are transferred to the pans by means of pipettes.

The pieces of hay result in a fairly uniform distribution of the larvae and reduce any possible loss from cannibalism ; it appears advisable to maintain equal numbers of each instar in the pans as the larger larvae keep the surface film from becoming too thick. At the beginning of the breeding work when the larvae are all of the same instar, they are densely crowded to keep down the surface film, and later their numbers are maintained at not more than 400 to a pan. Pupae are removed daily, by means of a pipette, to an emergence cage, in which the surface of the water is sprinkled with bits of chaff to ensure the even distribution of the pupae and to aid the emergence of the adults.

A cyclical change was observed in the reaction of the water in the pans. The pond water employed had an initial pH of 6·8. After falling to 6·1 on the day following the addition of the hay, the pH rose again to 6·8 by the fifth day and the water eventually became neutral or even alkaline. The controlled temperature of 70°F. promotes the rapid multiplication of infusoria and thus aids the maintenance of an adequate supply of food for the larvae. Under these conditions the life-cycle from egg to adult takes about 21 days.

Boyd (M. F.). **A Note on the Preparation of Anopheline Dissections for Examination.**—*Amer. J. Hyg.*, xvi, no. 3, pp. 836–838. Baltimore, Md., November 1932.

Methods are described by which permanent mounts may be made of the stomachs and salivary glands of Anophelines infected with malaria.

Boyd (M. F.). **Methods for the Manipulation and Conservation of Anopheline Imagines.**—*Amer. J. Hyg.*, xvi, no. 3, pp. 839–844, 3 figs. Baltimore, Md., November 1932.

Descriptions are given of various apparatus which have proved of value in the handling of Anophelines employed in the transmission of

malaria. Individuals in which infection is developing are kept in an incubator at a temperature of 20–22°C. [68–71·6°F.], and on becoming infective they are stored in a refrigerator at 2–17°C. [35·6–62·6°F.], only being removed to feed. In order to minimise the danger of their becoming entangled in drops of moisture condensing on any solid surface in the interior of the container on its removal to the warm air, the cage employed consists of a cylinder of bobbinet stretched over a brass frame and tied in position, having only a narrow ring of brass exposed in the interior, which is covered with a strip of filter paper. The ends are covered with squares of bobbinet secured by rubber bands. The cage is capable of holding about 10 individuals, allowing about 5 cu. ins. space to each. When the mosquitos are being removed, the bobbinet square is replaced by two thicknesses of thin rubber material, each having a slit in the centre. These slits intersect at right angles and form a self-closing orifice, the whole being secured by a rubber band. To avoid injuring engorged mosquitos while separating them from unfed ones, a special apparatus is employed, consisting of a test tube secured over one tine of a spring forceps, and a sliding lid placed over the other tine.

Infective mosquitos employed for inoculation purposes may be applied to patients in the bobbinet cages. When single mosquitos only are to be employed, it is preferable to use a wooden ring, covered with a bobbinet square held round a small rim on the outer edge by a rubber band.

It is important to allow the mosquitos access to a rabbit the day following their infective feeding and also to induce the maximum number to feed. During the extrinsic incubation period, the rabbit should be exposed to the caged mosquitos for about 15 minutes every third day. After sporozoites are present in the salivary glands and the mosquitos have been removed to the refrigerator, they should be allowed to feed on the rabbit only once a week. Pledgets of moist cotton wool are kept in each cage in order to maintain humidity at saturation and to give the insects an opportunity to drink. They are not given any fruit or other saccharine food. All cages are examined daily for the detection of dead mosquitos, which are removed for dissection.

Boyd (M. F.) & Stratman-Thomas (W. K.). **Studies on *Plasmodium vivax*. 1. The Microgametocytes as a Factor in the Infectiousness of the Infected Human.**—*Amer. J. Hyg.*, xvi, no. 3, pp. 845–850. Baltimore, Md., November 1932.

The following are the authors' conclusions: Refractiveness to infection with *Plasmodium vivax* is a not infrequent characteristic of *Anopheles quadrimaculatus*, Say, in the vicinity of Tallahassee, Florida. Some refractory individuals are found in practically every lot employed. This refractory characteristic cannot be overcome by repeatedly feeding the mosquitos on a patient. Its nature is unknown. Repeated feedings increase the intensity of infection in susceptible mosquitos only quantitatively. The proportion of mosquitos in a lot that become infected qualitatively is not attributable to the density of the gametocytes at the time of feeding. The quantitative character of the infection in those mosquitos that become infected is directly dependent upon the number of microgametocytes present in the patient's blood at the time of feeding.

Boyd (M. F.). **Studies on *Plasmodium vivax*. 2. The Influence of Temperature on the Duration of the Extrinsic Incubation Period.**—*Amer. J. Hyg.*, xvi, no. 3, pp. 851–853, 1 graph. Baltimore, Md., November 1932.

Studies were carried out in Florida on the duration of the extrinsic incubation period of *Plasmodium vivax* in *Anopheles quadrimaculatus*, Say, kept at mean temperatures varying from 19·3 to 26·9°C. [66·74 to 80·42°F.]. As the temperature increased, the mortality of the mosquitos became greater, so that at minimum temperatures in excess of 24°C. [75·2°F.], very few survived sufficiently long for sporozoites to occur in the salivary glands. The shortest incubation period occupied 11 days at a minimum mean temperature of 24·2°C. [75·56°F.] and maximum of 25·4°C. [77·72°F.]. It is considered unlikely that *P. vivax* would be widely transmitted naturally during the extreme heat of mid-summer, and a limit in its geographical distribution is possible, unless the local Anophelines are better adapted to continuous high temperatures than *A. quadrimaculatus* appears to be.

Hall (D. G.). **Some Studies on the breeding Media, Development, and Stages of the Eye Gnat *Hippelates pusio* Loew (Diptera : Chloropidae).**—*Amer. J. Hyg.*, xvi, no. 3, pp. 854–864, 12 figs., 14 refs. Baltimore, Md., November 1932.

The eye-gnat, *Hippelates pusio*, Lw., is particularly abundant in southern California [*cf. R.A.E.*, B, xviii, 251, etc.]. Adults are present throughout the year, but are most abundant in spring and autumn. They are not active at temperatures below 70°F. During the hot summer months, they were most numerous in dense shade and appeared to be attracted by moisture. Under insectary conditions, when high temperatures, low humidity and intense light were avoided, they fed freely on meat and fruit juices, sugar-water and vegetable matter in various stages of decay, but did not live for more than 7 days. In the field, eggs were laid on various materials such as decaying meats, excrement, decaying fruits and vegetable matter, all of which, with the exception of the excrement, were in advanced stages of decomposition. Oviposition may occur throughout the year, the eggs being deposited singly and promiscuously on or near the larval food. The method of obtaining eggs and rearing adults is described. The incubation period, which varies with the temperature and moisture, averages about 3·7 days during favourable seasons. The larvae, which are active as soon as they hatch, begin to feed when they are transferred to a suitable substance. Being negatively heliotropic, they usually burrow into the food or surrounding sand, but if the medium is sufficiently moist they may work on the surface. They appear to feed on the products of decay rather than upon the larger portions of the decaying material. In the insectary, human excrement proved the most favourable medium for rearing larvae, the percentage of pupation being 84 ; among the fruits, well-rotted figs and oranges gave the best results, the percentage of pupation being 83. The results show that faecal pollution of moist soil is an important though not the only factor in the breeding of eye-gnats. From observations on 866 individuals the larval stage lasted 5–46 days depending on the medium, moisture and temperature ; on human excrement the approximate average length was 11·4 days, on dog manure 8·7, and on decaying oranges 17. Fermenting or sour substances were unfavourable to development.

Pupation takes place either in the food material or in the surrounding sand, and the pupal period lasted on the average for 9·8 days. The immature stages are all sensitive to desiccation but can withstand submergence for short periods in water. All stages of the fly are described.

Eskey (C. R.). **Epidemiological Study of Plague in Peru with Observations on the Antiplague Campaign and Laboratory Work.**—*Publ. Hlth. Reps.*, xlvii, no. 47, pp. 2191–2207, 2 pls., 1 map. Washington, D.C., 18th November 1932.

This paper is a summary of a report on investigations in Peru, where plague has been present in epidemic form since 1903. The distribution of the disease in man and its seasonal prevalence are discussed. With the exception of a few outbreaks of short duration, it has been confined to the narrow strip of sea-coast Provinces extending the entire length of Peru and to adjacent mountain Provinces north of 12° S. Lat. All the evidence obtained points to the fact that *Xenopsylla cheopis*, Roths., is the chief vector, although the greatest incidence of plague occurred in communities in which the rat harbourage of buildings was greatest, regardless of whether the town was situated within or outside the zone most favourable to the existence of this flea. It was the most common species found on rats throughout the coastal region ; a few individuals were also taken on guineapigs, dogs, cats, opossums and man. The *cheopis* index of rats caught in buildings or closely associated with buildings in fields of cotton, sugar-cane and maize or in untreated garbage dumps was sufficiently high to account for the transmission of plague among them, whereas the index of rats caught in sewers, along the banks of irrigation ditches and in orchards near Lima was lower than is generally considered necessary for the propagation of epizootics. It seems probable that the protected nesting places of rats caught in the former situations are necessary for the multiplication of the flea, and that even in the climate of Lima, which is drier and more moderate than that of most parts of the world, this species cannot persist among sewer rats and rats living in underground burrows. The exterior temperatures of Lima throughout the year are within the range required for the existence of *X. cheopis*, but during the warmer months the index appeared to be slightly lower, although it increased again with the onset of cold weather in May. The reduction was probably due rather to the fact that the fleas spend less time on their hosts during the warmer months, than to an actual decrease in their numbers. When most of the rats were caught in buildings, the *cheopis* index was always high, regardless of whether the zone of the city where they were caught was residential or commercial. The data collected during the survey suggest that when 50 per cent. or more of the examples of *X. cheopis* found on rats are females the climatic conditions, or the places harbouring the rats, are not so favourable to the existence of the flea as when the percentage of females is below 50. The average length of life of 14 unfed individuals of *X. cheopis* was 4–5 days when the mean temperature was 63·3°F. and the relative humidity very high. The infestation of *Mus musculus* by it was lower than that considered necessary for the propagation of plague among these animals, as only one flea was found to every five mice examined. In Peru lack of rainfall, high humidity and moderate temperatures provide conditions favourable to the existence of *X. cheopis*, as well as for rats living out

of doors, and yet even the relative rat-proof construction of buildings in this country has reduced the incidence or prevented the establishment of plague in many coast towns. It is pointed out that in most parts of the world where *X. cheopis* is the transmitting agent, plague could never exist in epidemic form if the buildings were so constructed and maintained that the rat population within them was reduced to a minimum.

The difficulties of eradicating plague from a country where it occurs not only in the rat population of urban areas but also in field rats that migrate in accordance with the crop seasons are discussed. The organisation of personnel and the methods used in the anti-plague campaign begun in Peru at the end of 1930 were similar to those adopted in Ecuador in 1929–30 [*R.A.E.*, B, xix, 17]. There seems to have been a great reduction in the incidence of plague since the beginning of the campaign, and the use of poison against rats has apparently yielded satisfactory results.

THEODOR (O.). **Sobre sistemática de los flebótomos sudamericanos.** [On the Classification of South American *Phlebotomus*.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 764–786, 21 figs., 15 refs. Buenos Aires, 1932.

The classification and identification of South American sandflies (*Phlebotomus*) by characters of the pharynx, buccal cavity and spermathecae are discussed [*R.A.E.*, B, xx, 111, 228], and a list is given of the 24 American species.

MAZZA (S.), SCHÜRMANN (K.) & GUTDEUTSCH (H.). **Estudio comparado de la infección natural y experimental del quirquincho de Jujuy por** *Trypanosoma cruzi*. [A comparative Study of the natural and experimental Infection of the Armadillo in Jujuy by *T. cruzi*.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 954–968, 15 figs., 4 refs. Buenos Aires, 1932.

A single instance of natural infection of *Chaetophractus vellerosus*, with *Trypanosoma cruzi* observed in Jujuy [*R.A.E.*, B, xix, 203] is the only one that has been recorded in Argentina. This paper describes artificial infections of this armadillo by using the excreta, rich in flagellates, of *Triatoma infestans*, Klug, which is common in Jujuy.

ROMAÑA (C.) & SCHÜRMANN (K.). **La infección espontánea y la experimental del tatú del Chaco santafesino por el** *Tripanosoma cruzi*. [The spontaneous and experimental Infection of the Armadillo in the Chaco region of the Province of Santa Fé by *T. cruzi*.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 969–980, 1 map, 5 refs. Buenos Aires, 1932.

Several cases of natural infection of *Dasypus novemcinctus* with *Trypanosoma cruzi* in the province of Santa Fé, Argentina, have been observed since it was first discovered [*R.A.E.*, B, xix, 203]. Both this armadillo and guineapigs have been infected experimentally with *T. cruzi* by injecting suspensions of the excreta of *Triatoma infestans*, Klug, which in the Chaco region is heavily infected in nature. *T. infestans* also acquired infection by feeding on infected armadillos.

PRADO (A.) & NEIVA (C.). **Observações sobre** *Oestrus ovis* **L., com a descripção do hipopigio adulto e das placas estigmaticas da larva.** [Observations on *O. ovis*, with Descriptions of the Adult Hypopygium and of the stigmal Plates in the Larva.]—*Rev. Industr. anim.*, ii, no. 8, pp. 905–908, 2 figs., 8 refs. S. Paulo, August 1932. (With a Summary in English.)

Infestation of man by *Oestrus ovis*, L., has not been recorded in Brazil although the fly is abundant there. In this paper descriptions from Brazilian material are given of the male hypopygium and the stigmal plates of the larvae of various instars, which provide useful characters for specific determination.

SHAW (E. B.). **St. Croix's rainiest Year causes an Epidemic of Malaria.** —*Science*, lxxvi, no. 1981, pp. 566–567, 1 ref. New York, 16th December 1932.

In St. Croix, one of the Virgin Islands, only 15 cases of malaria were reported between 1918 and 1930, and 14 were in persons who had acquired the infection in Porto Rico. Anophelines were present, but the rainfall was insufficient to furnish breeding-places for rapid multiplication. The rainfall in 1931 was the highest recorded for 80 years, and a severe outbreak of malaria started in July, over 900 cases receiving medical aid. Preventive measures, particularly drainage of low-lying areas, would minimise the possibility of another similar outbreak.

[DANILOVA (M. I.) & ZUBAREVA (S. P.).] **Данилова (М. И.) и Зубарева (С. П.). On the Influence of Light on the larval Development of** *Anopheles maculipennis*. [*In Russian.*]—*Bull. Inst. Rech. biol. Perm*, viii, no. 2, pp. 57–64, 1 pl., 1 chart, 7 refs. Perm, 1932. (With a Summary in English.)

A detailed account is given of experiments carried out in the district of Perm in 1931 in which larvae of *Anopheles maculipennis*, Mg., were reared in glass containers under various conditions of light, all other conditions being identical. Some of the containers were painted with black varnish, others surrounded by a black screen so that they only received reflected light from above, others placed in a dispersed light, and some exposed to the direct rays of the sun. The tabulated results show that light is in itself of no importance to the larvae, since in the various containers no difference was observed in their size or the duration of the instars. This accounts for their natural occurrence in sunny or shaded water [*R.A.E.*, B, xvi, 174], and even in wells, cellars, etc., provided that the water has a mineral bed and no appreciable amount of dead organic remains [xiii, 109], though in the field, light is probably of significance in increasing photosynthesis of the plants [xiii, 110] so that the water is supplied with oxygen and the organic matter is destroyed. In the laboratory the larvae were very susceptible to high temperature, mortality being severe in containers exposed to direct sunshine when the temperature of the water rose to 29°C. [84·2°F.] or above. It is likely, therefore, that excessive insolation may prevent the development of larvae in the field in shallow water in which they cannot escape overheating by moving downwards.

The experiments incidentally confirmed those of Achundow [xvii, 32] on the effect of external conditions on the colour of the larvae and

resulting adults. Larvae and adults that developed under exposure to full light were only slightly pigmented, those from screened containers were darker, and those from the black ones were almost black.

[DANILOVA (M. I.) & BRYUKHANOVA (A. A.).] **Данилова (М. И.) и Брюханова (А. А.). Malaria in the Subdistrict Bredy, Ural Province, U.S.S.R.** [*In Russian.*]—*Bull. Inst. Rech. biol. Perm*, viii, no. 2, pp. 65–94, 1 map, 17 refs. Perm, 1932. (With a Summary in English.)

Since the epidemic of malaria that occurred throughout the whole Russian Union in 1922–25, benign tertian [*Plasmodium vivax*] has been endemic in the coal-mining district of Bredui in the south-east of the Ural Province, an average of over 8 per cent. of the population being infected annually in 1926–29. As people are constantly arriving from malarious regions in Central Asia, an epidemic is always possible. Investigations were carried out in the summer of 1930 on the factors that favour the development of the disease. The topography and climate of the country, with special reference to the development of *Anopheles maculipennis*, Mg., which is the only vector, are discussed, and a detailed description is given of the various types of water in which the larvae breed, and the associated vegetation and fauna. Favourable breeding-places are afforded by shallow lakes, pools and streams in river valleys, the larvae being especially abundant in small rivers with a slow current and containing dense submerged vegetation, along which most of the villages are situated. No larvae occurred in highly polluted water. *A. maculipennis* may continue to breed for 5 months of the year, four generations being produced in a season, as the average temperature varies from 14°C. [57·2°F.] in May to 24·6°C. [76°F.] in July and 20·1°C. [68°F.] in August. During the day, the adults shelter in dwellings and outhouses, but not in animal quarters, as these are exposed to intense sunlight and wind. Hibernating females occurred in various uninhabited buildings close to the rivers, at temperatures varying from –6° to 8°C. [21·2–46·4°F.].

The measures suggested include the planting of trees to shade the edges of water and the destruction of submerged aquatic vegetation to discourage the breeding of the mosquitos, dusting stagnant waters with Paris Green, destruction of adult mosquitos in their day shelters and hibernation quarters, and screening. New settlements should be situated on high banks of rivers that have a rapid current and are devoid of aquatic vegetation, and animal quarters, which should be properly protected from the sun and wind, should be built between the water and the houses.

[BRUISOVA (G.) & PUSHKINA (Z.).] **Брысова (Г.) и Пушкина (З.). Die Larven von *Hypoderma bovis* in der Sowiet-Wirtschaft Jugokamsk (Kreis Perm).** [Larvae of the Ox Warble-fly on the Yugo-Kamsk Dairy-Market-Garden Soviet Farm. [*In Russian.*)]—*Bull. Inst. Rech. biol. Perm*, viii, no. 2, pp. 95–104, 1 chart, 3 refs. Perm, 1932. (With a Summary in German.)

This paper is an attempt to apply statistical methods to parasitology, as a result of investigations in June–July 1931 on the degree of infestation of cattle by *Hypoderma bovis*, DeG., in a locality in the Ural Province. The rate of infestation was about 50 per cent., the maximum number of larvae on an animal being 19 with an average among those

infested of 1·4–1·8. The heaviest infestation occurred among cows 2–7 years old. The larvae left the animals at any time from the beginning of May till the end of August. In cases when it was difficult to extract them by hand, the warbles were treated with iodoform, which dried up the larvae.

BENARROCH (E. I.). **Observations sur l'exflagellation des microgametocytes du paludisme humain.**—*Riv. Malariol.*, xi, no. 5, pp. 610–614, 3 refs. Rome, 1932. (With Summaries in Italian, p. 747, French p. 749, English p. 750, German p. 751.)

The author has studied in Venezuela the flagellation *in vitro* of the microgametocytes of *Plasmodium falciparum* and *P. vivax* in blood from 8 patients. Six positive results, which took place at varying times up to an hour, were obtained from 65 observations. No flagellation occurred when the patients were under quinine treatment. When flagellation was absent *in vitro*, infection was hardly ever obtained in mosquitos ; 200 individuals of various tropical species were tested, with only one positive result (with *Anopheles albimanus*, Wied.).

The co-existence of Anophelines and malaria without the occurrence of transmission (*i.e.*, without infection in mosquitos) may perhaps be explained by a study of flagellation. Some years ago in Venezuela the author dissected many specimens of *A. darlingi*, Root, without finding one to be infected, in spite of the fact that the parasite index of the population was 40 per cent., and the splenic index 100, and that all the mosquitos were taken in dwellings. Later on this mosquito was found to be an important vector [*R.A.E.*, B, xx, 9]. The author believes that the gametocyte-carriers in the first instance were not infective.

PECORI (G.) & ESCALAR (G.). **Relazione sulla campagna antimalarica nell'Agro Romano durante l'anno 1931.** [Report on the antimalarial Campaign in the Area round Rome during 1931.]—*Riv. Malariol.*, xi, no. 5, pp. 615–675, 11 figs., 2 maps, 2 graphs. Rome, 1932. (With Summaries in Italian p. 748, French p. 749, English p. 751, German p. 752.)

This report follows the same lines as previous ones [*R.A.E.*, B, xix, 104, etc.]. *Anopheles maculipennis*, Mg., the first males of which were taken on 10th April, was the only Anopheline observed, except a few individuals of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) found in animal quarters.

KLIGLER (I. J.) & MER (G.). **Studies on Malaria. VIII. The Migration of Infected *A. elutus* at various Seasons of the Year.**—*J. Prev. Med.*, v, no. 5, pp. 401–407, 1 fig., 3 refs. Baltimore, Md., September, 1931. (Abstract in *Trop. Dis. Bull.*, xxix, no. 5, pp. 344–345. London, May 1932).

KLIGLER (I. J.) & MER (G.). **Studies on Malaria. X. Behaviour of *A. elutus* in Relation to Housing and Malaria.**—*Riv. Malariol.*, xi, no. 5, pp. 553–583, 2 figs., 6 charts, 9 refs. Rome, 1932. (With Summaries in Italian p. 747, French p. 748, English p. 750, German p. 751.)

The information contained in the first paper and some of that in the second have already been noticed [*R.A.E.*, B, xx, 192]. In the latter an account is given of a systematic investigation of the behaviour of

Anopheles sacharovi, Favr (*elutus*, Edw.) in a Bedouin encampment and a Jewish village near the Huleh marshes in Palestine during 1931. Adults are present throughout the year, but breeding takes place only from the beginning of March to the beginning of November. During this period, the area of marsh in which larvae are found increases as the water recedes ; this is probably due to the variations in the temperature of the water resulting from changes in its depth.

The seasonal distribution of the adults, as determined by fortnightly catches in huts and stables, showed a sudden rise in April to a peak in May and June and a gradual decline until the first half of September, followed by a sharp rise in October. Variations in fertility [*cf.* xix, 122] and reductions of the number of adults emerging in July and August were not commensurate with the sharp drop in the numbers of adults, which could only be attributed to an increased adult mortality. In stables, the maximum was reached in the middle of May and coincided with a slight drop in the numbers in huts, whereas in the huts the highest density was attained in the middle of June and persisted for two months, during which period there was a sharp drop in the numbers caught in stables. About the beginning of May, animals are removed from the stables and kept out of doors at night, and the inhabitants themselves begin to sleep and also to cook outside the huts, and these factors are probably responsible for the changes of habitat in the mosquitos. Apparently, in a stable where cattle remain at night, Anophelines seek both food and shelter and remain after feeding, whereas in empty stables they seek shelter only after having fed out of doors on cattle or man. Observations in huts showed that although fumigation (by means of smoke from cooking fires inside) or increased ventilation tended to decrease the accumulation of Anophelines, they are not sufficient to repel all individuals entering during the night.

Adults of *A. sacharovi* emerging during the summer were smaller than those emerging in spring, a fact that may affect the ease or difficulty with which the mosquito feeds on its human or animal host ; the authors suggest that the differences in size are brought about by the influence of temperature on the rate of development, *i.e.*, the more rapid the development, the smaller the adult. Precipitin tests showed that the percentage of Anophelines containing human blood increases during the summer, when the people sleep out of doors, and the fact that this mosquito feeds outside was confirmed by direct observations On the other hand, its activity generally centres round huts and stables, although occasional individuals feed as far as 200–250 yards from a human habitation. Whereas in houses and huts (and probably also in stables) *A. sacharovi* is apparently active throughout the night, in the open it mainly attacks man or cattle not long after sunset or before sunrise. For this reason, sleeping out of doors near a village lessens the chance of becoming infected with malaria. On the other hand, in comparison with *A. hyrcanus*, Pall., *A. sacharovi* seems to be badly adapted to feeding in the open, as it is disturbed by the slightest breeze ; the consequent need for repeated feedings to complete a blood meal may thus enhance the possibility of obtaining infection and of conveying it to more than one person during the same night. In the autumn when the people began to sleep and cook inside, and the animals were returned to the stables, the number of mosquitos in stables was again greater than that in huts.

In the Jewish village, the results agree with those obtained at the encampment, namely, that the distribution and relative concentration

of *A. sacharovi* in houses and stables respectively depend on whether the host or hosts are bitten indoors or outside.

These results are discussed in relation to various general aspects of the malaria problem as outlined by Lane [xx, 56].

KLIGLER (I. J.), MER (G.) & OLITZKI (L.). **Studies on Malaria. XI. Seasonal Variations in the Food Preference of** *Anopheles elutus*.—*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 3, pp. 283–287, 2 refs. London, 30th November 1932.

Details are given of precipitin tests on freshly ingested blood from *Anopheles sacharovi*, Favr (*elutus*, Edw.) in houses and stables in the Bedouin camp and the Jewish village mentioned in the preceding paper. The mosquitos were collected at weekly intervals from April to August and during October and November 1931. Among all the mosquitos caught in the village, the percentage that had fed on man was relatively higher in May, June and November than during the other months, but only in June was it relatively higher among those taken in stables only. Although the conditions of housing, the relation of stables to houses and the relative number of cattle in relation to man are entirely different in the encampment, the results of the test were largely the same, though the total percentage of man-fed mosquitos was higher. Among all the mosquitos caught, the percentage that had fed on man was low in April and May and relatively high in June and November. There was a relatively high percentage in stables during June, July and August, and it is thought that the extension of the period of high incidence in the encampment is due to the fact that the inhabitants sleep out of doors during July and August, and consequently a relatively larger number of man-fed mosquitos find shelter in stables.

If these findings indicate that there is a seasonal difference in the attractiveness of food sources for these mosquitos, or that climatic conditions such as temperature, humidity, etc., affect directly or indirectly their feeding preference, such factors may also account for the predominance in certain countries of so-called zoophilous races. The constant low percentage of man-fed mosquitos in April and early May points to the possibility that in colder climates the feeding habits of Anophelines differ from those in warmer ones.

ADDERLEY (E. S.). *Anopheles distinctus*.—*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 3, pp. 273–274, 5 refs. London, 30th November 1932.

Adults of *Anopheles distinctus*, Newst. & Cart., were taken in houses in Northern Rhodesia early in 1932. Larvae were subsequently found in well-shaded seepage pools and, just after the end of the rainy season, in swamp pools. The adult and larva are very briefly described, and the slight distinctions between the larva and that of *A. theileri*, Edw., are pointed out. The pupae of the two species are apparently indistinguishable.

MACGREGOR (M. E.). **The Occurrence of Roubaud's " Race autogène " in a German strain of** *Culex pipiens* **in England : with Notes on Rearing and Bionomics.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 3, pp. 307–314, 6 refs. London, 30th November 1932.

The author has studied the bionomics of the British strain of *Culex pipiens*, L., since 1925 under a varied range of laboratory breeding

conditions, but has never encountered an autogenous race [*cf.* *R.A.E.*, B, xviii, 169, etc.]. On the other hand, adults obtained from an Elberfeld strain sent from Germany laid eggs without taking a blood meal, and the rafts contained 99–110 eggs as compared with an average of 312 in rafts from wild *C. pipiens* laid under natural conditions out of doors. Larvae of the Elberfeld strain grew equally well in rich hay infusion with or without the addition of rabbit excreta. The progeny of females caught in nature and reared under the same conditions produced adults that survived for a considerable period but laid no eggs, a fact that seems to prove that the local British race is not capable of autogenous development. The provision of honey in the cages had no effect on the oviposition of autogenous females, but prolonged the lives of the adults, particularly the males. No increase in the average number of eggs in the rafts was observed when apple or other fruit was placed in the cages, and in no experiment with the British race did oviposition occur when a diet of fruit alone was provided. Females of the autogenous race, isolated as pupae, laid a few rafts of eggs, but all were infertile, thus showing that despite close confinement of males and females together in cages as small as 6 ins. square (which is often a part of the regular breeding routine) pairing occurs with such regularity that 100 per cent. of the females lay fertile eggs. Thus the male swarms in sheltered places under natural conditions may not be primarily the means adopted to secure the fertilisation of the females.

The technique that has proved very satisfactory for rearing both the normal and autogenous forms is described. The cages are of wood 2½ ft. sq., with 3 sides and the top enclosed by wire gauze and also able to be wholly or partly covered by glass screens. Inside are small electric radiators, to maintain the required temperature of 20–25°C. [68–77°F.], and over them are water containers with variable wicks for evaporation. The atmosphere in the cages should be kept near saturation point. Small secondary cages consisting of wire frames covered with mosquito-netting are used for handling different batches of mosquitos.

Egg rafts are placed in glass jars containing a rich hay infusion or preferably tap water to which some crumbs of brown bread are added from time to time. Hay infusion is apt to decompose rapidly; moreover, a film soon covers the surface and if this is not broken up daily it will kill the young larvae by suffocation [*cf.* xxi, 36]. The larvae are reared at 20–22°C. [68–71·7°F.]. The pupae are placed in open petri dishes (with twigs to help the weak emerging adults) and kept in the secondary cages at 20–25°C. If the adults are to be fed on blood, they are kept in the large cages for four days, and then allowed to feed on a canary. About 80–100 per cent. feed to repletion at the first opportunity.

When females of the autogenous race were fed on blood four days after laying their first egg rafts, they oviposited a second time 9–19 days later, and the rafts were considerably larger, although the number of eggs (136–224) was less than in the normal rafts. These eggs produced autogenous females, and in subsequent experiments autogenous females have been maintained on a blood diet over five serial generations and yet, when no blood was given to the females of the sixth generation, they laid ordinary autogenous rafts. The feeding of blood to females before autogenous oviposition in no way affected the size of the egg rafts.

Wood (T. F. M.). **Two simple Anti-mosquito Measures.**—*J. Roy. Army Med. Cps.*, lix, no. 6, pp. 450–452, 1 fig., 1 ref. London, December 1932.

The author describes a method that has been used with success in the Punjab for preventing the breeding of mosquitos in borrow pits that are too deep to drain and too large to fill. A wall 2 ft. high by 3 ft. wide is constructed round the edge to prevent the shallow surface water on the surrounding ground from accumulating in the pit ; this water disappears in a few days owing to evaporation and percolation. To deal with water that may still collect in the pit, the floor is levelled with a slight fall towards one end where a small pit 4 ft. square by 4 ft. deep is dug. This has a small wall a few inches high built round its edge, and a certain amount of evaporation and percolation take place from the floor of the larger pit. Any water that eventually collects in the smaller pit can easily be treated every week with oil or Paris green.

The author also describes an economical modification of Wetmore's method of oiling [xvi, 8]. Tins with air-tight lids are filled with oil, weighted with a few stones to make them sink and, when required for use, punctured top and bottom by means of a hammer and nail and thrown into slowly flowing water. The oil escapes gradually and spreads an even film over the surface.

Papers noticed by Title only.

Musgrave (A.). **Bibliography of Australian Entomology 1775–1930 with biographical Notes on Authors and Collectors** [including a subject index.]—Roy 8vo, viii+380 pp. Sydney, R. Zool. Soc. N.S.W., September 1932.

Berland (L.). **Les Arachnides (Scorpions, Araignées, etc.). Biologie systematique.**—*Encyc. ent.*, (A) xvi, 486 pp., 636 figs., many refs. Paris, 1932. Price *Fr.*150.

[Pavlovskiĭ] Pawlowsky (E. N.), Stein (A. K.) & [Perfil'ev] Perfiljew (P. P.). **Experimentelle Untersuchung über die Wirkung des *Phlebotomus*stiches auf die Menschenhaut.** [An experimental Investigation on the Effect on the human Skin of the Bite of *Phlebotomus*.]—*Z. Parasitenk.*, v, no. 1, pp. 1–13, 8 figs., 34 refs. Berlin, 1932.

Kemper (H.). **Beiträge zur Biologie der Bettwanze** (*Cimex lectularius*, **L.**). **IV. Ueber das Zerreissen des Darmtraktus und die Mortalität unter ungünstigen Lebensbedingungen.** [Contributions to the Biology of the Bed-bug (*C. lectularius*). IV. Laceration of the Gut Wall and Mortality under adverse Conditions.]—*Z. Parasitenk.*, v, no. 1, pp. 112–137, 2 figs., 14 refs. Berlin, 1932.

Mudrow (E.). **Ueber die intrazellulären Symbionten der Zecken.** [Intracellular Symbionts of Ticks.]—*Z. Parasitenk.*, v, no. 1, pp. 138–183, 31 figs., 53 refs. Berlin, 1932.

Rondelli (M. T.). **Ixodoidea del Museo di Torino.**—*Boll. Mus. Zool. Anat. comp. Univ. Torino*, (3) xli, no. 6, reprint 10 pp., 2 refs. Turin [1932].

RONDELLI (M. T.). *Hyalomma* **nuovi delle colonie italiane.** [*Hyalomma erythraeum*, sp. n., and *H. tunesiacum* subsp. *ganorai*, n., from Eritrea and *H.t.* subsp. *franchinii*, n., from Libya.]—*Atti Soc. ital. Sci. nat.*, lxxi, no. 2, pp. 119–125, 3 figs., 5 refs. Milan, September 1932.

MCINTOSH (A.). **Description of a** [New] **Tick,** *Dermacentor halli*, **from the Texas Peccary, with a Key to the North American Species of** *Dermacentor*.—*Proc. U. S. Nat. Mus.*, lxxxii, art 4, pp. 1–6, 1 pl., 1 fig. Washington, D.C., 1932.

BRADLEY (M. A.) & HUNT (M. G.). **Index to Publications of the United States Department of Agriculture 1901–1925.**—Med. 8vo, vi+2689 pp. Washington, D.C., Govt. Ptg. Office, 1932. Price, buckram, $3·25.

ROMAÑA (C.). **Sobre una dermatosis ampollar provocada por el " bicho moro "** *Lytta adspersa* **o** *Epicauta adspersa* **Klug.** [On a vesicatory Dermatitis caused by *E. adspersa*.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 621–624, 2 figs. Buenos Aires, 1932.

MAZZA (S.) & DE LOS RIOS (M.). **Primera comprobación de miasis cutánea por** *Dermatobia hominis* **en Jujuy.** [The first Record of cutaneous Myiasis in Man due to *D. hominis*, Say, in Jujuy.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 787–796, 8 figs. Buenos Aires, 1932.

PARMA (B.), ROMAÑA (C.) & CODAZZI AGUIRRE (J. A.). **Comprobación de la Ura en el norte Santafecino.** [A Record of furuncular Myiasis in Man due to *Dermatobia hominis*, Say, in the North of the Province of Sante Fé.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 797–800, 4 figs. Buenos Aires, 1932.

CODAZZI AGUIRRE (J. A.). **Nota sobre miasis por** *Cochliomyia macellaria* **en el norte Santafecino.** [A Note on Myiasis in Man due to *C. macellaria*, F., in the North of the Province of Santa Fé.]—*7. Reun. Soc. argent. Pat. reg. Norte, Tucuman, 1931*, ii, pp. 801–803, 1 fig. Buenos Aires, 1932.

SCHUURMANS STEKHOVEN, jr. (J. H.). **Tabanids from Sumatra and Borneo. (Fifth Supplement to my Monograph : The Tabanids of the Dutch East Indian Archipelago.)** [Including two new species.] —*Tijdschr. Ent.*, lxxv, Suppl., pp. 78–83, 3 figs. Amsterdam, 1932.

WAGNER (J.). *Tunga bondari*, **eine neue Art der Sandflöhe.** [*T. bondari*, a new Sand-flea from Brazil.]—*Novit. zool.*, xxxviii, no. 1, pp. 248–249,4 figs. Tring, 30th December 1932.

JORDAN (K.). **Siphonaptera collected by Mr. Harry S. Swarth at Atlin in British Columbia.**—*Novit. zool.*, xxxviii, no. 1, pp. 253–255, 2 figs. **Siphonaptera collected by Mr. J. L. C. Musters in Norway on the Lemming.**—*T.c.*, pp. 256–257, 2 figs. **Siphonaptera collected by Mr. C. Elton in Lapland.**—*T.c.*, pp. 258–260, 1 fig. **Siphonaptera collected by Herr George Stein in the High Tatra.**—*T.c.*, pp. 261–263, 4 figs. **A new** *Xenopsylla* [*hawaiiensis*, sp. n., on rats] **from Hawaii.**—*T.c.*, pp. 264–266, 4 figs. **New Oriental Fleas.**—*T.c.*, pp. 267–275, 10 figs. **Siphonaptera collected by Harold Stevens on the Kelley-Roosevelt Expedition in Yunnan and Szechuan.**—*T.c.*, pp. 276–290, 17 figs. **Notes on Siphonaptera.**—*T.c.*, pp. 291–294. Tring, 30th December 1932.

Hirst (L. F.). **Report of the City Microbiologist for 1931.**—*Rep. Med. Off. Hlth. Colombo 1931*, xxvi, pp. 38–41. Colombo, 1932.

The rat-flea survey of Ceylon was completed during 1931 [*cf. R.A.E.*, B, xix, 15]. Almost every important centre of population has been examined, and sufficient rat-fleas have been collected from different types of premises in each locality to demonstrate the relative distribution of the various species. The results show clearly that the lowlands in which *Xenopsylla astia*, Roths., predominates are being irregularly invaded by *X. cheopis*, Roths., which is probably carried in grain. In the highlands, *X. cheopis* is well distributed on rats in urban districts, reaching its maximum proportionate prevalence (90 per cent.) at an altitude of about 4,000 ft. At 6,000 ft., the predominant rat-flea is *Leptopsylla segnis*, Schönh., although *Stivalius phoberus*, J. & R., and *Ceratophyllus tamilanus*, J. & R., the indigenous fleas of field rodents, form a considerable proportion of the fleas found on domestic ones at this height. *X. astia* does not appear to be well adapted to cool climates and tends to disappear at the higher elevations, whereas *X. cheopis* is much less restricted. From the combined results of this survey and of one carried out in Madras [xx, 27], it is concluded that those parts of the lowlands that are still free from *X. cheopis* are only liable to mild outbreaks of plague that show no tendency to persist from one season to the next. The danger zones are considered to be the bazaar quarters of Colombo, Kurunegala and Anuradhapura, where the *cheopis* index is high, and more especially the mountain regions between 1,500 and 4,500 ft., where most of the plague outbreaks have so far occurred.

Hardy (G. H.). [Report of] **Walter & Eliza Hall Fellow in Economic Biology.**—27 pp. multigraph. Brisbane, Queensland Univ., 1932.

In this report the author summarises work that has been carried out since 1922 with regard to sheep blow-flies and their parasites in Australia, where he has established the importance of *Lucilia cuprina*, Wied., as the chief species attacking sheep [*cf. R.A.E.*, B, xx, 163]. The subjects dealt with include the inherent variation in the prepupal stage ; temperature and pupal development ; the effect on the maggots of bacterial decomposition of carrion ; parasites and their efficiency ; studies on migration of blow-flies ; the elucidation of their specific identity ; the possibility of using Australian blow-flies for maggot therapeutics [*cf.* xx, 125–129] ; and bacterial action associated with the invasion of living tissue by blow-fly larvae.

Roberts (F. H. S.). **The Botflies of the Horse.**—*Queensland Agric. J.* xxxviii, pt. 4, pp. 338–343, 3 figs., 1 ref. Brisbane, 1st October 1932.

The information contained in this somewhat popular paper on the bionomics and control of *Gastrophilus intestinalis*, DeG., *G. nasalis*, L., and *G. haemorrhoidalis*, L., in Australia is largely taken from the literature. The dose of carbon bisulphide recommended is 6 cc. for every 250 lb. weight of the horse ; it should be administered in the form of a capsule after a fast of eighteen hours [*cf. R.A.E.*, B, viii, 36]. No purgative is needed, either with or following the treatment, and no

food or water should be given for three hours. If there is any doubt as to the animal's ability to tolerate the dose, it may be divided and treatment suspended if ill effects follow the partial dose.

Russell (P. F.). **Daytime Resting Places of Anopheles Mosquitoes in the Philippines (Second Report).**—*Proc. Ent. Soc. Wash.*, xxxiv, no. 8, pp. 129–138, 4 pls., 9 refs. Washington, D.C., November 1932.

In this paper are given the results of further routine day-time catches of adult Anophelines [*cf. R.A.E.*, B, xx, 59], in houses, in and under a concrete hospital building, in small under-cut caves along stream banks and on the side of an old stone wall. The figures suggest that sheltering places out of doors are much preferred to the inside of buildings.

Hinman (E. H.). **A Description of the Larva of** ***Anopheles atropos*** **D. & K., with biological Notes on the Species.**—*Proc. Ent. Soc. Wash.*, xxxiv, no. 8, pp. 138–142, 9 refs. Washington, D.C., November 1932.

The fourth-stage larva of *Anopheles atropos*, D. & K., is described. Larvae were taken in two salt marshes in Louisiana in April and May 1932 from shallow depressions containing small amounts of water of 1·85 and 0·8 per cent. salinity, respectively. They developed in fresh or distilled water to which sodium chloride had been added in an amount equivalent to that found in the original habitat, as readily as in water from the pools, provided that a supply of yeast was maintained at the surface. The range of salinity that this species will tolerate appears to be wide [*cf. R.A.E.*, B, xvi, 33], doubtless because it must adjust itself to brackish water following rains and to water with a high salt content after the breeding pools begin to evaporate. Laboratory observations indicate that under optimum conditions the life-cycle may be completed in 10 days or less. Eggs were laid on the surface of the water in a beaker [*cf.* xi, 170]. The species appears to be most abundant in autumn, winter, and spring, as there is a marked diminution in its numbers during July-September. The adults attack man readily even in bright sunlight or wind and are exceedingly difficult to dislodge. They are equally voracious at night and are also attracted to lights.

Holt (R. L.) & Russell (P. F.). **Malaria and** ***Anopheles*** **Reconnaissance in the Philippines.**—*Philipp. J. Sci.*, xlix, no. 3, pp. 305–372, 6 pls., 1 fldg. map, 1 fig., 60 refs. Manila, 1932.

Details are given of a survey of the Philippine Islands carried out between November 1930 and March 1932 during which data on the distribution of Anophelines and the incidence of malaria were obtained from 41 out of the 48 Provinces. The 546 separate collections of larvae comprised 22 out of the 24 species of *Anopheles* recorded from the Philippines.

The following is taken from the authors' conclusions : Malaria is a serious and widespread disease in the Philippines, but its incidence and intensity are irregular ; it is not prevalent along the low coastal plains, on the flat plateaux or in the mountains above 2,000 ft. It is almost always associated with Anophelines of the *minimus* group, *viz.*, *A. mangyanus*, Banks, *A. filipinae*, Mnlg., and *A. minimus*, Theo., the

Philippine form of which possibly represents a distinct variety (*flavirostris*, Ludl.) [*R.A.E.*, B, xx, 235], and this observation, together with the published facts on infectivity in these mosquitos both in nature and in the laboratory [xvii, 64; xix, 51, 186, etc.], suggests that they include the chief vectors, although it is possible that other species may occasionally be incriminated. They breed chiefly in streams, rivers and irrigation ditches, and distinctly prefer clean, flowing water, in shady rather than open places. They have occasionally been found in still pools and in wells, but never in salt water, rice fields or any water at an altitude higher than 2,000 ft. Thus malaria appears to be primarily a disease of the foothills, and is found chiefly between the coastal plain and the higher ground and between the higher ground and the mountains.

ROBERTSON (R. C.). **Relapsing Fever in Shanghai (First Report).**—*Chinese Med. J.*, xlvi, no. 9, pp. 853–885, 4 pls., 3 charts, 18 refs. Peiping, September 1932.

This paper on relapsing fever in China contains a section on the transmission of the disease. The seasonal occurrence of the disease in epidemic form and the fact that it affects chiefly the poorer classes in Shanghai suggested that *Pediculus humanus*, L. (*vestimenti*, Nitz.) was the vector, and the laboratory observations here reported confirm this belief. Of three cases occurring in one family, spirochaetes were found in two but were not seen in the third until a week later; on the other hand spirochaetes were numerous in lice infesting the third patient. All the cases examined were infested with lice, which were usually numerous. Of 147 lice taken from 28 patients, 15 per cent. were infected. Negative results were obtained from the examination of a small number of newly-hatched lice. Spirochaetes could be found on the day of capture and the two days following, but those seen on the third day were probably metacyclic forms. A single bed-bug [*Cimex lectularius*, L.] and a single louse taken from one case were both found to contain spirochaetes. The morphology of the spirochaete in the louse is described. Of 22 mice inoculated with 78 lice, 5 became infected. In addition to the fact that it is louse-borne, the symptoms in laboratory animals suggest that the disease is caused by a strain of *Spirochaeta recurrentis*.

GALLIARD (H.). **Quelques diptères vulnérants du Gabon.**—*Ann. Parasit. hum. comp.*, xi, no. 1, pp. 24–25, 2 refs. Paris, 1st January 1933.

As a result of observations made in western Gabun, brief notes are given on *Simulium damnosum*, Theo., *Culicoides grahami*, Aust. [*cf.* *R.A.E.*, B, xx, 102], *Auchmeromyia luteola*, F., and Tabanids, of which 16 species are recorded.

SCHWETZ (J.). **Sur une épizootie de theileriose mortelle (East Coast Fever) à Stanleyville (Congo belge).**—*C. R. Soc. Biol.*, cxi, no. 40, pp. 1100–1102, 2 refs. Paris, 1932.

Since 1927, large numbers of cattle from various localities in the north and north-east of the Belgian Congo have been examined and *Theileria mutans* has been found to be prevalent, but no mortality due to this

infection has been observed. An account is given of an epidemic among cattle that occurred from October 1931 to February 1932 on a farm near Stanleyville. The acuteness of the disease, the high mortality, the predominance of bacillary as opposed to annular forms of the causal organism, and the presence in Stanleyville of *Rhipicephalus appendiculatus*, Neum., led to the conclusion that the outbreak was due to *Theileria parva*, which has not previously been recorded from central equatorial Africa, although in certain points the disease did not correspond exactly to typical African Coast fever.

HAMLYN-HARRIS (R.). **Some further Observations on** *Chara fragilis* **in Relation to Mosquito Breeding in Queensland.**—*Ann. Trop. Med. Parasit.*, xxvi, no. 4, pp. 519–524, 9 refs. Liverpool, 16th December 1932.

The author describes experiments carried out in Queensland showing that *Chara fragilis* in most phases of growth does not prevent the larvae of the two house mosquitos, *Aëdes aegypti*, L. (*Stegomyia fasciata*, F.) and *Culex fatigans*, Wied., or the tree-hole breeder, *Aëdes notoscriptus*, Skuse, from reaching maturity. Moreover, in experiments in which the adults of the first two species were given access to jars containing various types of aquatic vegetation, they selected for oviposition only those containing *C. fragilis*. There are numerous cases in which waters containing species of *Chara* are not found to produce mosquitos, but the positive evidence here presented confirms the author's previous observations [*R.A.E.*, B, xvi, 202; xix, 70] and disproves the contention of Matheson and Hinman [xix, 209, etc.] that Characeae have a lethal effect on mosquito larvae. *Anopheles annulipes*, Wlk., had been found breeding during the summer months in the horse troughs from which the supply of *C. fragilis* was obtained. In one experiment, some of the larvae of *C. fatigans* were killed by the fungus, *Saprolegnia monica*, and by *Hydra*.

LESTER (H. M. O.). **The Influence of Cyclical Transmission by** *Glossina tachinoides* **on a Strain of** *Trypanosoma brucei*, **made resistant to Human Serum.**—*Ann. Trop. Med. Parasit.*, xxvi, no. 4, pp. 525–537, 1 diag., 15 refs. Liverpool, 16th December 1932.

If the theory of Yorke and his colleagues regarding the derivation of *Trypanosoma rhodesiense* and *T. gambiense* from *T. brucei* is correct [*R.A.E.*, B, xviii, 174], the resistance to human serum acquired by *T. rhodesiense* and fixed in *T. gambiense* must survive cyclical transmission by *Glossina*. In order to test this point, a series of mice infected with *T. brucei* were injected repeatedly with doses of human serum until the trypanosomes became resistant. A series of 300 laboratory-bred individuals of *G. tachinoides*, Westw., fed for 6 consecutive days on a guineapig into which the serum-fast strain had been inoculated were subsequently allowed to bite a healthy animal. A scanty infection was observed in this guineapig 45 days later. Tests with this strain in mice showed that although the virulence acquired in a series of direct transmissions had been greatly lowered, the resistance to human serum had not been affected. The loss of virulence was shown to be due to cyclical transmission and not to the effect of the human serum by the fact that the virulence of the original serum-fast strain was not decreased when it was transmitted directly. Other cyclical

transmissions were not successful owing to the difficulty of passing the strain through *Glossina*, although when first isolated it was readily transmissible.

GIBBINS (E. G.). **A Note on the Relative Size of the Anal Gills of Mosquito Larvae breeding in Salt and Fresh Water.**—*Ann. Trop. Med. Parasit.*, xxvi, no. 4, pp. 551–554, 4 figs., 1 ref. Liverpool, 16th December 1932.

Observations on larvae of *Anopheles christyi*, Newst. & Cart., *Culex decens*, Theo., *C. vansomereni*, Edw., and *C. pipiens*, L., in Uganda showed that in each species the anal gills in individuals from salt water breeding-places are reduced in size and, in the case of the first two species particularly, have also assumed a different shape.

DUKE (H. L.). **The Polymorphic Trypanosomes of Damba Island, Victoria Nyanza. II. Their Transmissibility by** *G. palpalis*.—*Ann. Trop. Med. Parasit.*, xxvi, no. 4, pp. 597–601, 5 refs. Liverpool, 16th December 1932.

In order to test the transmissibility of the three strains of polymorphic trypanosomes recovered from wild *Glossina palpalis*, R.-D., on Damba Island [*cf. R.A.E.*, B, xx, 222], laboratory-bred individuals of *G. palpalis* were fed once or twice on infected monkeys, starved for 48 hours, and then fed on alternate days on fowls until the 25th day after the infecting feed. They were then fed on clean animals and finally dissected. Flies dying during the first few days of the experiment were discarded, as most of them had not fed and trypanosomes in those that had might have been passive survivals in the undigested blood. The other flies were dissected when they died. Totals of 409, 304 and 417 flies were dissected, the percentages of infection being 1·9, 2·9 and 7·6 and the transmissibility index [*cf.* xvii, 40] 1·3, 2·9 and 5·0 respectively. The transmissibility of the third strain is higher than that of the majority of the strains of *T. gambiense* examined and approaches that commonly attained by strains of *T. rhodesiense*. Moreover, it is more readily transmissible than any strain previously isolated from *Tragelaphus spekei* on Damba Island.

TAYLOR (A. W.). **Pupal Parasitism in** *Glossina morsitans* **and** *G. tachinoides* **at Gadau, Northern Nigeria.**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 463–467, 1 graph, 7 refs. London, December 1932.

During 1930 and 1931, 106,047 puparia of *Glossina tachinoides*, Westw., and 17,346 of *G. morsitans*, Westw., were collected in the Sherifuri-Gadau area of northern Nigeria and stored in the laboratory in order to determine the rate of emergence of the flies and the parasites attacking them. From the number of apparently viable pupae collected by one man in one day, it was possible to estimate the seasonal variations in breeding rates of these species of *Glossina*, and it was found that breeding is largely confined to the dry season. The parasites comprised a single individual of *Perilampus violaceus*, F., from *G. morsitans*, 10 of *Stomatoceras micans*, Wtrst., from both *G. morsitans* and *G. tachinoides*, and the Bombyliid, *Thyridanthrax argentifrons*, Aust., which appears to be the only one of importance and formed 6 per cent. of the total emergences from puparia of *G. tachinoides* in March and 2 per cent. from those of *G. morsitans* in April.

BEATTIE (M. V. F.). **The Physico-chemical Factors of Water in Relation to Mosquito Breeding in Trinidad.**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 477–496, 2 pls., 11 figs., 15 refs. London, December 1932.

The author gives a detailed account of field experiments with *Anopheles tarsimaculatus*, Goeldi, and laboratory experiments with *Aëdes aegypti*, L. (*argenteus*, Poir.) carried out between June 1929 and April 1931 in Trinidad to determine the effect of various physico-chemical factors on the breeding of mosquitos. It is concluded that ammonia nitrogen has some restricting influence on the prevalence of *Anopheles tarsimaculatus*, affecting oviposition rather than the growth of the larvae, but that *Aëdes aegypti* prefers to deposit eggs in water containing organic nitrogen in solution, the experimental waters containing the highest amounts proving the most attractive. A list is given of the mosquitos collected, which include the following Anophelines: *Anopheles albimanus*, Wied., *A. apicimacula*, D. & K., *A. argyritarsis*, R.-D., *A. bellator*, D. & K., *A. eiseni*, Coq., and *A. tarsimaculatus*.

POMEROY (A. W. J.) & MORRIS (K. R. S.). **The Tsetse Problem on the Eastern Cattle Route in the Gold Coast.**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 501–531, 2 pls., 8 graphs, 3 maps (1 fldg.), 12 refs. London, December 1932.

An account is given of the work on the control of *Glossina* and trypanosomiasis of cattle that has been carried out in the Gold Coast since 1925, the results of which have been noticed from time to time [*cf. R.A.E.*, B, xix, 151, etc.]. The investigations were chiefly undertaken on the eastern cattle route in the Northern Territories [xviii, 218]. The type of country, the distribution and nature of the fly belts, and the clearings made at river crossings are described.

It is concluded that when clearing has to be carried out at widely divergent points on a cattle road or main trade route with the object of obtaining the maximum benefit for the project as a whole, it is necessary not only to study closely the fly community at each place but also to estimate correctly the plant community, a fact that is well illustrated by the extraordinary divergence in the nature of re-growth of vegetation in clearings and its effect on the re-establishment of the fly. In estimating the amount of clearing necessary at any given place, it is important to consider the density of the fly belt, the amount of migration occurring up and down the river, the scarcity of food, and the movement of animals from the uncleared into the cleared area, since these factors are likely to influence the movement of the fly into the clearing. The experiments undertaken were directed solely against *G. palpalis*, R.-D., and *G. tachinoides*, Westw., and the main object was their exclusion from the clearings, rather than the elimination of primary foci. The results show that the entire removal of all vegetation is advisable and that the work should begin as soon as the subsidence of the flooded rivers allows [xix, 151]. On one or two occasions when a few tall trees were left standing, any tsetse-flies caught were invariably found under or close to them; the flies also appear to use them as landmarks and may traverse the whole clearing by flying from one tree to the next. Farming prevents the encroachment of bush and the re-establishment of tsetse provided that the narrow strip of unfarmed land along the river banks is kept free from vegetation.

The great variety of natural conditions, climatic, geological, floral and faunal, in the Gold Coast accounts for the presence of a number of species of *Glossina* with widely diverging habits. Climatic factors operating on the fly are responsible for its seasonal distribution and dispersal, but their greatest influence appears to be indirect by means of their effect on vegetation. The apparently direct relation between vegetation and the fly may in reality be indirect, the decisive factors being the localised conditions of temperature, humidity or light within the plant community. Temperature and humidity seem to be the factors of greatest importance in influencing the metamorphosis of the fly in the pupal stage. Geological conditions influence distribution indirectly through their effect on vegetation. For *G. palpalis* and *G. tachinoides* a certain type of plant community is apparently essential, but within this environment, their distribution appears to be determined largely by the presence of certain preferred hosts. *G. morsitans*, Westw., seems to be most independent of vegetational factors, its distribution being mainly influenced by food. In the areas investigated the following species may be of economic importance : *G. palpalis*, *G. tachinoides*, *G. morsitans* and *G. longipalpis*, Wied., on the main cattle route ; *G. palpalis* on the coastal plains of the Eastern Province ; *G. palpalis* and possibly *G. fusca*, Wlk., in certain portions of the true forest of Ashanti ; and *G. palpalis* and *G. longipalpis* on the fringes of the rain forest belt. The bionomics of the more important species are given in some detail. Other species recorded are *G. medicorum*, Aust., *G. nigrofusca*, Newst., *G. pallicera*, Bigot, and *G. caliginea*, Aust.

In an appendix entitled " An ecological study and experimental clearing at Makongo," K. R. S. Morris gives the results of a preliminary tsetse-fly survey, a more detailed ecological survey and observations on the effect of clearing the fly belts carried out in 1929 and 1930 at a sleeping-sickness centre 6 miles north of Yeji ferry. The topography, vegetation, fauna, shade temperature and humidity are discussed. *G. tachinoides* and *G. palpalis* were both present in the riverside communities, but *G. palpalis* alone occurred in the *Isoberlinia* woodland. The absence of *G. morsitans*, which had previously been recorded from this area, was probably due to the disappearance of the larger antelopes. Smaller game animals, small mammals and reptiles, together with natives and passing herds of cattle, afford an adequate source of food for the other species. The distribution of *G. palpalis* was markedly influenced by the proximity of a road, along which cattle passed almost daily, and by village water-holes. During the dry season, the primary foci were always the places of greatest relative humidity, and the fly did not move from these until the general atmospheric humidity had reached a certain fairly high degree. In clearing the fly belts, all primary foci within $\frac{1}{4}$ mile of the town and all thick bush within 100 yards of water-holes were removed. The clearing of *Isoberlinia doka* woodland resulted in the disappearance of *G. palpalis*, which did not subsequently return to the clearings. *G. tachinoides* was eliminated for three months when the riverside *Ficus congensis* fly belt was destroyed, but returned when there was a general increase and up-stream migration of the fly. *G. palpalis* remained in this clearing in fluctuating numbers until June, when observations were suspended. Nine months after clearing, a very dense re-growth was found in the *Isoberlinia* clearings, but no tsetse-flies could be found living in or passing through it. In the riverside clearings, the re-growth had been cut or burned and no flies were found. These observations suggest

that if such dense low growth could be maintained at each end of a riverside clearing, it might prove an effective barrier against tsetse-flies migrating from the uncleared area. Moreover, a study of the re-growth indicates that clearing may possibly destroy a primary focus by altering the plant association; at Makongo the secondary bush may permanently replace the original tall woodland as a consequence of the drying up of the ground after the original clearing. It is concluded that the small amount of clearing undertaken will effect a very satisfactory control of the fly in the dry season at least. In the wet season observations were made only a few months after clearing, and it has been found by experience that such observations are of little value in predicting what will happen in subsequent years.

HARDY (G. H.). **Some Australian Species of *Calliphora* (Subgenera *Neopollenia* and *Proekon*).**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 549–558, 6 figs. London, December 1932.

The author discusses the classification of various Australian species of *Calliphora* belonging to the subgenera *Neopollenia* and *Proekon* and describes 4 new ones. *C. nociva*, sp. n., is of seasonal occurrence in most parts of Victoria and New South Wales, but along the coastal area of South Australia it appears to be permanently established; inland, it has become a pest of sheep, although it is usually rare in sheep country during the warmer months of the year. In Queensland, *C. augur*, F., seems to be eliminated in normal years during the early summer, though it may possibly survive under favourable climatic conditions. Experiments have shown that it is subject to disease during the hot weather, when carrion becomes putrid so rapidly that the maggots cannot successfully breed in it. If putrefaction occurs before the maggots are mature, they may leave it later, apparently fully fed and in a healthy condition, but the skins turn brown in patches instead of forming puparia and the maggots dry up. All species of *Calliphora* appear to be subject to the disease, some being more susceptible than others, and this may account for the disappearance in Queensland of flies that normally breed in the southern States. In further experiments, the same type of disease was induced in *Lucilia*.

LEREW (W. M.). **The Sheep Industry. Helpful Hints to Sheep-men. 5.—The Sheep Blowfly.**—*J. Dept. Agric. Vict.*, xxx, pt. 11, pp. 515–523, 8 figs. Melbourne, November 1932.

This article on sheep blow-flies and their control in Australia is a revision of one already noticed [*R.A.E.*, B, xviii, 68], the additional information being taken from the literature.

HOLDAWAY (F. G.). **Fly Strike of Sheep: A Natural Phenomenon.**—*J. Coun. Sci. Ind. Res. Aust.*, v, no. 4, pp. 205–211, 31 refs. Melbourne, November 1932.

The theories as to the causes of infestation of sheep by blow-flies in Australia are summarised and briefly discussed. In the carcases of mammals the eggs are laid in the hair or wool, and early larval development takes place in the hair and on the skin; as the procedure in the

attack of living sheep is similar, it is suggested that fly strike is a comparable natural phenomenon. Normally the nutrition of the larvae of primary flies (those that occur early in the ecological succession in carcases [*R.A.E.*, B, xviii, 273] and initiate strike) is associated with bacterial activity. Bacteria are present on the skin, and provided that there is adequate moisture, dead cells and other organic material form a suitable medium for their multiplication. A study of fly attack on living animals shows that there is a succession of flies similar to that occurring on dead ones. The natural corollary that fly strike of sheep is also associated with bacterial activity in the presence of adequate moisture and a suitable nutrient medium has now been demonstrated. During the autumn of 1931, observations were made on fly strike on the body of the sheep, since attack in this case is devoid of the complications occurring when other parts of the animal are infested. Moisture was provided by continuous rains, and the bacterial conditions that preceded strike were those known as "water rot" and "weather stain." One of the organisms associated in many cases with the latter condition is *Pseudomonas aeruginosa* (*Bacillus pyocyaneus*). The fact that there is always a high bacterial count in wool prior to strike has since been confirmed. "Crutch strike" is similar to "body strike," but in the latter the necessary moisture is supplied by rain, wet grass and dull or humid weather, whereas in the former it is supplied by urine and wet faeces, the maintenance of moist conditions in the breech being favoured by high humidity and by wrinkles in the skin.

MACKERRAS (I. M.). **Buffalo Fly Investigations. A Note on the Occurrence of** *Hydrotaea australis* **Malloch in Northern Australia.**—*J. Coun. Sci. Ind. Res. Aust.*, v, no. 4, pp. 253–254, 1 ref. Melbourne, November 1932.

Flies of the genus *Hydrotaea* are harmless as adults, and their larvae live in dung and prey on those of other Diptera. *H. dentipes*, F., was introduced from England into Australia with a view to its utilisation against the buffalo fly [*Lyperosia exigua*, de Meij.] and allied species, but it could not be reared in captivity and was not liberated. The author points out that there are two species, *H. australis*, Mall., and *H. fuscocalyptrata*, Macq., indigenous to Australia. The latter has not been recognised in recent collections, but brief notes are given on the former. Adults are commonly found on horses and cattle, apparently feeding on the sweat and "scurf." On cattle they have frequently been mistaken for *L. exigua*. Larvae and puparia have been found in dung in many localities in northern Australia, occupying the same stage of dung succession as the larvae of *L. exigua* [*R.A.E.*, B, xx, 258]. The local parasites, *Spalangia orientalis*, Graham [*loc. cit.*] and *Phaenopria* sp. attack the puparia of *H. australis*, but not so readily as those of *L. exigua*, and do not appear to affect its numbers appreciably. It is widely distributed from Western Australia to Queensland and has been recorded on the north coast of New South Wales. It occurs throughout the area of actual or potential distribution of *L. exigua*, and in northern Australia it is present in both wet and dry seasons. In view of the existence of a well-adapted and widely-distributed native species of *Hydrotaea*, it seems unlikely that the breeding of *L. exigua* would be appreciably reduced by the introduction of another species of the same genus.

Macleod (J.). **Preliminary Studies in the Tick Transmission of Louping-Ill. (I) Review and Analysis of previous Transmission Experiments ; (II) A Study of the Reaction of Sheep to Tick Infestation.**—*Vet. J.*, lxxxviii, pp. 276–284, 1 chart, 8 refs. London, July 1932.

Gordon (W. S.), Brownlee (A.), Wilson (D. R.) & Macleod (J.). **" Tick-borne Fever " (A hitherto undescribed Disease of Sheep).**—*J. Comp. Path.*, xlv, pt. 4, pp. 301–307, 5 refs. Croydon, December 1932.

In the first paper the author discusses the results obtained by early workers on louping-ill in sheep [*cf.* *R.A.E.*, B, vii, 17, etc.], and describes experiments in Scotland undertaken to determine whether ticks (*Ixodes ricinus*, L.) can cause in sheep a febrile reaction not due to this disease and, if so, whether it is due to irritation or an infective agent [*cf.* xx, 206, 266]. The fact that none of the uninfested control sheep showed an increase in temperature in any way comparable with that obtained in infested experimental sheep under the same conditions, and that no reaction resulted from the massive infestation of sheep with nymphal ticks that had fed as larvae on a healthy laboratory animal suggested that the reaction was due to an infective agent transmitted by the ticks. Moreover, it was produced by subinoculation, even when the blood was taken as long as 44 days after the febrile reaction in the original sheep had subsided [*cf.* xx, 206]. Sheep that have reacted to the virus of louping-ill have been shown to be immune from infection by intracerebral reinoculation of the virus, and as such immunity was not observed in sheep that had recovered from the febrile reaction described, this condition is regarded as distinct from louping-ill.

In the second paper the authors record preliminary observations on the nature of the disease discussed above, and describe experiments to show that it was responsible for the febrile reactions observed in sheep on a " diseased farm," including some that were immune from louping-ill and others that were not, that a specific immunity from it can be produced in sheep, and that it and louping-ill are immunologically distinct.

Hill (R. B.) & Olavarria (J.). **Estudio del paludismo en Campo Lugar (Cáceres).** [A Study of Malaria in Campo Lugar.]—*Rev. San. Hig. públ.*, vii, no. 6, pp. 461–472. Madrid, June 1932.

These investigations at a small village in the province of Cáceres, Spain, were made from May to November 1931 to ascertain the seasonal amount of malaria there, the distribution of Anopheline larvae, and the abundance, distribution, and feeding-habits of the adult mosquitos, all of those taken being *Anopheles maculipennis*, Mg. Only a few larvae were found in wells, though at the end of November, larvae of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) appeared in them, the eggs hatching at the low temperature of 4°C. [39·2°F.]. Pools in stone-quarries served as breeding-places in spring and autumn, but not in summer, probably because they became covered with *Lemna*. A stream and rivulets were the only important breeding-places during the entire period of investigation. The former had almost dried up in June and was covered with water-plants that afforded excellent shelter to the larvae. Adults were captured in 9 dwellings and in 11 stables of which 5 were parts of dwelling houses. Of these, 611

females were taken in the dwellings and 4,728 in the stables. Precipitin tests showed that the great majority of engorged females had fed on animals.

Figueira (L.) & Landeiro (F.). **Relatorio do primeiro ano de luta antisezonática (1931).** [Report of the first Year's anti-malarial Work at Benavente.]—*Arq. Inst. bact. Cam. Pest.*, vi, no. 3, pp. 191–243, 18 figs., 5 diag., 1 map, 2 refs. Lisbon, 1932. (With a Summary in French.)

Bôto (R.). **Resultado das observações efectuados nos concelhos de Benavente e Salvaterra de Magos sôbre a distribuição da** *Gambusia* **e a sua provável procedencia.** [The Result of Observations in the Municipalities of Benavente and Salvaterra de Magos on the Distribution of *Gambusia* and its probable Origin.]—*T.c.*, pp. 245–249, 1 map.

In 1931 at Benavente in Portugal, on a tributary of the Tagus, *Anopheles maculipennis*, Mg., represented 96·3 per cent. of 71,663 mosquitos and was the only Anopheline captured. Besides quinine treatment, anti-larval measures were applied in a zone with a radius of 3,300 yards round the town, with a result that new infections in the town were only one-third of the number of those from the district generally. The work covered about 250 acres of marshy land, chiefly rice-fields. Paris green was applied from the ground and by an aeroplane flying over the rice-fields, oil being used in a very few places. Some apparently suitable breeding-places were free from larvae, and this was found to be due to *Gambusia holbrooki*, which had apparently come down the Tagus from Spain, where it had been introduced against mosquito larvae.

The second paper records the distribution of *G. holbrooki* in the district of Benavente and confirms the introduction of this fish from the Tagus.

[Gruić (I.).] **Грујић (И.). The Zoophilism of** *Anopheles* **as a Factor in the Disappearance of Malaria and the Importance of its Study in our Country.** [*In Serbian.*]—*Glasn. tzentr. khig. Zavoda*, vii (xiv), no. 4–6, pp. 160–175, 4 refs. Belgrade, 1932. (With a Summary in German.)

Various theories regarding the causes of the regression of malaria in northern and central Europe are reviewed from the literature, including those of zootropism and zootropic races in *Anopheles maculipennis*, Mg. [*R.A.E.*, B, ix, 153; xv, 181; xvi, 210; xix, 68]. In 1924 Ivanić found that in Jugoslavia both *A. maculipennis* and *A. superpictus*, Grassi, show a marked preference for domestic animals, the frequency of the attack on man being in inverse proportion to their presence.

In southern Serbia these two Anophelines are very prevalent and malaria is widespread. In August 1931 in the district of Kumanovo, the author found the females to be comparatively rare in houses and very numerous in animal quarters, whereas the percentage of the males in these was considerably lower than in houses. The percentage of engorged females was three times as high in animal quarters as in houses. Of 117 females taken in the former only one contained human blood. The majority had fed on pigs, though pigs constituted only 7·4 per cent.

of all the domestic animals present. As malaria is severe in this district, it would appear that zootropism in the Anophelines does not reduce its incidence, unless conditions are created that increase the protection it affords to man. It is important, therefore, that animal quarters should be separated from human dwellings and situated between them and the breeding-places of the mosquitos. During the summer, domestic animals should not be kept in the field at night, as is usual, but should be sheltered in sheds, in which the doors and windows should be open to permit the entrance of mosquitos. Since pigs are particularly attractive, more of these should be kept, and they should be housed in buildings that afford good protection from wind and weather and so are attractive to Anophelines.

HASE (A.). **Weitere Beiträge zur Kenntnis von Aethylenoxyd als Schädlingsbekämpfungsmittel.** [Further Contributions to the Knowledge of Ethylene Oxide as an Insecticide.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xx, no. 2, pp. 101–110, 2 figs., 3 refs. Berlin, August 1932. [Recd. January 1933.]

Experiments on the action of ethylene oxide on *Cimex lectularius*, L., and *C. hemiptera*, F. (*rotundatus*, Sign.) [*R.A.E.*, B, xx, 80] have been continued. Whereas 6 oz. of the liquid per 100 cu. ft. of space failed to produce 100 per cent. mortality (including eggs) after 8 hours, complete mortality was obtained with 5 oz. after 24 hours, so that the practical minima must be close to these strengths and times. To ensure rapid evaporation the liquid was sprinkled on sand spread on a tray. The gas was found to have great power of penetration. In one experiment a cylinder containing the bugs (including eggs) was wrapped in 32 layers of thick cotton fabric and fumigated with ethylene oxide at the rate of 5 oz. per 100 cu. ft. Examination after 48 hours showed complete mortality, so that this fumigant is very suitable for baled goods.

[ZASUKHIN (D. N.).] **Засухин (Д. Н.).** *Nuttallia minor* **n. sp. a new Blood Parasite of Horses. Preliminary Report.** [*In Russian.*]—*Rev. Microbiol.*, xi, no. 3, pp. 181–185, 1 fig., 1 pl., 27 refs. Saratov, 1932. (With a Summary in English.)

Nuttallia minor, sp. n., is described as causing disease in horses in various localities in the south-east of European Russia. The probable vectors are *Dermacentor niveus*, Neum., and *D. silvarum*, Olenev, which occur on horses in the spring in the southern and northern districts respectively, though *Hyalomma uralense*, Schulze & Schlottke, is numerous on them in late autumn, winter and early spring.

[KOLPAKOVA (S. A.) & LIPPERT (N. P.).] **Колпакова (С. А.) и Липперт (Н. П.). Contribution to the Biology of the Tick** *Rhipicephalus schulzei* **Olen. 1929.** [*In Russian.*]—*Rev. Microbiol.*, xi, no. 3, pp. 191–195, 10 refs. Saratov, 1932. (With a Summary in German.)

Studies on the bionomics of *Rhipicephalus schulzei*, Olenev, in western Kazakstan [*R.A.E.*, B, xx, 103] were continued in 1931, when it was taken in large numbers on ground squirrels (*Citellus pygmaeus*) and in their nests. The female ticks continued to oviposit for 10–50 days in summer, or longer in autumn, dying when oviposition was completed.

Lack of humidity caused mortality of both ticks and eggs. The eggs hatched in 17–35 days, and the life-cycle from egg to adult lasted 75–150 days. Neither larvae nor nymphs were able to moult unless they had engorged ; in several instances larval skins were found attached to the host, indicating that the larvae may moult on it. The ticks have great resistance to starvation ; larvae, nymphs and adults were still alive after having been deprived of food for 8, 7 and 10 months respectively.

In the field, eggs are probably laid in spring. The larvae were most abundant in May, and the nymphs in June. In July the immature stages were fewer and the adults more numerous. Oviposition again took place, and the larvae were abundant on ground squirrels in August, but the nymphs were comparatively rare in September and October. Besides *C. pygmaeus*, the larvae and nymphs also occurred on other small mammals, and adults were occasionally found on sheep, goats, dogs, camels and man.

Other ticks taken were *Ixodes laguri*, Olenev, in nests of *Citellus*, *Dermacentor niveus*, Neum., on camels, horses, cows and sheep, and *Hyalomma uralense*, Schulze & Schlottke, on camels.

[Pavlovskiĭ (E. N.), Blagoveshchenskiĭ (D. I.) & Alfeev (N. I.).] **Павловский (Е. Н.), Благовещенский (Д. И.) и Алфеев (Н. И.). Principal Problems of practical Study of Ticks for their Control.** [*In Russian.*]—*Bull. Leningrad Inst. Controll. Fm. For. Pests*, no. 2, pp. 207–216, 3 graphs, 9 refs. Leningrad, 1932.

A programme is outlined for the organisation of annual campaigns against ticks attacking domestic animals in the Russian Union, which involves preliminary observations on their biology in various regions in view of the great differences in the ecological conditions, and on their alternative hosts and seasonal occurrence on them. Instances are recorded of the finding of *Ixodes ricinus*, L., the chief host of which is cattle, on hedgehogs, rodents and birds, and, in large numbers, on a dog. It is important to determine seasonal variations in infestation of cattle in order to ascertain the best time for spraying or dipping, and the length of time during which the ticks remain on their hosts should be studied experimentally for each species. The concentrations of dips that are safe for cattle under the climatic conditions of the various regions should also be ascertained.

[Blagoveshchenskiĭ (D. I.).] **Благовещенский (Д. И.). Contribution to the Study of the Ox Warble Fly** (*Hypoderma*) **Control.** [*In Russian.*]—*Bull. Leningrad Inst. Controll. Fm. For. Pests*, no. 2, pp. 217–226, 15 refs. Leningrad, 1932.

Methods used for the control of *Hypoderma* on cattle in various countries are briefly reviewed. Experiments in 1931 near Novgorod showed that the application of ointments or fluid larvicides to the warbles is easier and also less painful to the cattle than squeezing out the maggots. As the organisation on a large scale of a campaign against warble-flies is being planned throughout the whole Russian Union, data should be collected on the rate and severity of infestation of the cattle in the various regions. Special attention should be devoted to determining the minimum period required for the development of the larvae in the subcutaneous tissues of the host, and the dates on which the first larvae and the maximum number of them emerge for pupation.

[BOGOYAVLENSKIĬ] BOGOJAWLENSKI (N. A.). **Die Malaria in Distrikt Kasach (Aserbajdschan) nach langjährigen Beobachtungen.** [Malaria in the Kasakh District of Azerbaijan as observed during many years.]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 1, pp. 19–28, 5 figs. Leipzig, January 1933.

The Kasakh district of Azerbaijan is a hilly region with a subtropical climate. The chief vectors of malaria are *Anopheles maculipennis*, Mg., and *A. superpictus*, Grassi. The seasonal incidence of the disease shows a small peak in April–May made up largely of relapses, with some new infections believed to be due to *A. maculipennis*, and a higher peak in autumn consisting almost exclusively of new infections caused by the mass-occurrence of *A. superpictus*, *A. maculipennis* playing a subordinate part.

A. maculipennis leaves its winter quarters towards the end of March. The first larvae occur early in April, and newly emerged adults appear in mid-May. This mosquito is abundant everywhere in spring and summer, breeding in swamps, springs in the river valleys, marshes formed by irrigation channels, and permanent pools in river beds. In autumn the larvae are displaced by those of *A. superpictus* in the river-bed pools, *A. hyrcanus* var. *pseudopictus*, Grassi, in the irrigation system, and *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) in the springs. *A. superpictus* leaves its winter quarters later than *A. maculipennis*, often appearing only in the second half of May. It breeds in pools in river beds, and in spring the larvae are rarely found because the pools are flushed by rain. They are most abundant from mid-July to October, and develop more slowly than those of *A. maculipennis*.

The breeding-places of *A. superpictus* are characterised by the absence of large vegetation, constant water-temperature, a prevalence of Desmidiaceae in the phytoplankton, and the presence of *Spirogyra*, and those of *A. maculipennis*, especially the springs, contain a macroflora including *Chara*, a luxuriant development of diatoms in the phytoplankton, and species of *Zygnema*. Both Anophelines are markedly blood-sucking at the period of their maximum abundance and are zoophilous. *A. superpictus* appears able to migrate for about 5 miles. Both species hibernate in animal quarters, becoming active from time to time and feeding on the animals even during the severest winter owing to the high average temperature in the sheds (15–19°C. [59–66·2°F.]). Hibernation begins in the second half of November, *A. superpictus* predominating in the villages in the river valleys, and *A. maculipennis* in the region of the springs. They do not occur in human dwellings owing to the smoke there, so that winter infections are unlikely to occur. The measures adopted are quinine prophylaxis, small-scale drainage, dusting with Paris green, and fumigation of animal quarters by burning tobacco dust mixed with dung.

ROUBAUD (E.) & GASCHEN (H.). **Différenciation des races biologiques de *Culex pipiens* L. par adaptation larvaire aux milieux ammoniacaux.**—*Bull. Soc. Path. exot.*, xxv, no. 10, pp. 1053–1058. Paris, 1932.

The authors discuss the two races of *Culex pipiens*, L., observed in France [*cf.* *R.A.E.*, B, xviii, 169; xix, 24, etc.]. The rural non-autogenous form usually breeds in small collections of water that are relatively unpolluted and rich in fermenting vegetable matter, whereas the autogenous urban form breeds chiefly in the very polluted waters

of underground systems of household waste disposal, rich in ammoniacal fermentation products, particularly cesspools connected with flushed water-closets or septic tanks receiving a large amount of water [*cf.* xx, 150].

A comparison of these types of breeding-places suggests that ammoniacal factors play an important, if not essential, part in determining the possibilities of development of the larvae in their respective habitats. Experiments in which larvae and eggs of the two races were placed in solutions of human urine, ammonia or ammonium carbonate of various concentrations confirmed this suggestion, for the eggs and larvae of the autogenous race were found to be much more resistant than those of the non-autogenous one.

SCHWETZ (J.). **Le " mystère " de la fièvre quarte et de la tierce bénigne en Afrique Equatoriale et Centrale.**—*Bull. Soc. Path. exot.*, xxv, no. 10, pp. 1062–1074, 6 refs. Paris, 1932.

The author gives an account of observations and experiments on the malaria parasites, *Plasmodium malariae, P. falciparum* and *P. vivax*, occurring in the neighbourhood of Stanleyville, Belgian Congo, where the most abundant Anophelines are *Anopheles gambiae*, Giles, *A. funestus*, Giles, *A. moucheti*, Evans, and *A. nili*, Theo. [*R.A.E.*, B, xviii, 209], and discusses various factors that may have a bearing on their incidence and behaviour.

BOYÉ (R.). **La papillonite Guyanaise.**—*Bull. Soc. Path. exot.*, xxv, no. 10, pp. 1099–1107. Paris, 1932.

A detailed account is given of further observations on the species of *Hylesia* that causes dermatitis at Cayenne, French Guiana [*cf. R.A.E.*, B, vi, 106]. Saturniids of this genus are found practically throughout the country from Mexico to Argentina, but it seems probable that the local swarms originate in the mangrove swamps to the south-east of the town. The clinical symptoms are described; the author did not observe the vesiculo-erythematous eruption previously mentioned [*loc. cit.*], the lesions being of an urticarious nature. A very detailed description is given of the hairs and poisonous spines (which occur only on the abdomen in the adult and not on the wings [*cf. loc. cit.*]) and the layers of cells from which they originate. In the evenings, when the moths flutter round lights, a cloud of fluff may be seen to form and settle gradually on the furniture, whence it may be picked up on the damp skin of the persons in the room, causing violent irritation. In the laboratory, eggs taken from a gravid female hatched in 15–20 days, the larvae, which fed on young shoots of white mangrove, completed their development in about 40 days, and the pupal stage lasted about a month.

GRACE (A. W.), GRACE (F. B.) & WARREN (S.). **The parallel Incidence of *Filaria bancrofti* and the β-haemolytic Streptococcus in certain tropical Countries.**—*Amer. J. Trop. Med.*, xii, no. 6, pp. 493–508, 3 figs., 10 refs. Baltimore, Md., November 1932.

In the course of this paper on an investigation in Jamaica, it is stated that *Filaria bancrofti* is occasionally introduced but does not spread in the Island, although *Culex fatigans*, Wied., which is the common vector elsewhere, is abundant.

SILER (J. F.). **Report of the Health Department of the Panama Canal for the Calendar Year 1931.**—Med. 8vo, 127 pp., 8 pls. Balboa Heights, C.Z., 1932.

In a paper on "The Anopheline Mosquitos of the Isthmus" (pp. 52–56), P. D. Curry gives a list of the 15 Anophelines recorded from Panama, of which *Anopheles albimanus*, Wied., appears to be the only important vector of malaria. The breeding-places and habits of *A. albitarsis*, Arrib. [*cf.* *R.A.E.*, B, xx, 109] and of the two varieties of *A. tarsimaculatus*, Goeldi [*cf.* xx, 93] are discussed. *A. bachmanni*, Petrocchi, previously taken only in association with water lettuce (*Pistia stratiotes*) [xx, 93], has recently appeared in patches of bladder-wort (*Utricularia*). This may be due to the fact that the former plant has largely disappeared from the waters of the Canal Zone, whereas *Utricularia* and one or more species of *Chara* have increased in Gatun Lake, probably as a result of a sequence of natural changes likely to occur in the flora of a lake over an area occupied 20 years ago by hill land and jungle. *A. albimanus* is prevalent in patches of *Chara*, which is more abundant and widespread than *Utricularia*, and during the dry season when there is more sunlight and the waters of the lake are lowered, acres of the surface are covered with this plant, which forms an ideal source of food and shelter for the larvae. It is thought that increased breeding in these areas may account for the flights of *A. albimanus* into controlled regions that have been observed towards the end of the dry season, before enough rain has fallen to create new breeding-places.

The mosquito breeding-places in the vicinity of the City of Panama and their control by dusting with Paris green from aeroplanes are discussed (pp. 59–64). A hopper with mechanism for releasing the mixture of dust and Paris green that can be easily installed and quickly removed is illustrated, with measurements. It has an agitating device (actuated by a small wind-driven propeller) in the throat of the hopper that ensures a uniform feed of the dust mixture, and the controls are operated by the pilot. The carrier used was a local clay, similar to fire-clay, dried and pulverised. The area selected for experiment is about 1½ miles long and 1 mile wide and is used for pasture ; during the rainy season it is trampled by the cattle into a quagmire with innumerable water-filled depressions that form ideal breeding-places for *A. albimanus* and other species of mosquitos. It is covered with pará grass and aquatic vegetation 1–5 ft. high. White enamelled developing trays containing a known number of larvae were placed in representative parts of the area to test the effectiveness of the dusting. The first application was made on 17th July with 1,200 lb. of a mixture containing 20 per cent. by weight Paris green, and 80–90 per cent. of the larvae in the trays were killed. A second application was made under the same conditions on 28th July and 86 per cent. of the larvae were killed. On 4th August the concentration of Paris green was reduced from 20 to 16 per cent., but the amount of the mixture used was increased to 1,500 lb., and approximately 80 per cent. of the larvae were killed. On 11th September the Paris green was reduced to 10 per cent., but the amount of mixture was increased to 2,400 lb., and the results obtained were even better, probably owing to the more satisfactory distribution of the Paris green. Weekly inspections of the area were continued, and it was found necessary to dust again on 18th December, when the amounts used were the same as in the previous

dusting. No living larvae could be found in the marsh on the following day. This method of control gave excellent results in this area and will probably be continued in 1932.

DAMPF (A.). **Concentration of Microfilariae by the Salivary Secretions of Bloodsucking Insects.**—*Science*, lxxvii, no. 1984, pp. 20–21, 2 refs. New York, 6th January 1933.

In the course of investigations in Mexico in 1930 on Simuliids concerned in the transmission of *Onchocerca caecutiens*, the author confirmed the observations of others as to the concentration of the microfilariae in the neighbourhood of the site of the bite of the vectors [*R.A.E.*, B, xx, 169].

IREDELL (A. W.). **An Account of Mosquito-proofing carried out by the Royal Air Force in India.**—*J. Roy. Army Med. Cps.*, lx, no. 1, pp. 33–37. London, January 1933.

Screening against mosquitos at two Royal Air Force stations in India in 1929 and 1930 is briefly described. In 1928, the figures for malarial incidence were the lowest recorded at all stations since the R.A.F. first served in India, and using them as a standard of comparison, it was found that the figures for subsequent years were on the whole lower in the two mosquito-proofed stations and higher in the five unproofed ones.

VAN HELL (J. C.). ***Anopheles minimus* var. *flavirostris* Ludlow.**—*Geneesk. Tijdschr. Ned.-Ind.*, lxxiii, no. 1, pp. 20–30, 1 fig., 7 refs. Batavia, 3rd January 1933.

Anopheles minimus, Theo., occupies a position between *A. aconitus*, Dön., and *A. varuna*, Iyen. During a recent visit, W. V. King stated that "divergent *aconitus* larva" [*R.A.E.*, B, vii, 184 ; viii, 54] from the Netherlands Indies and its corresponding adult were identical with the Philippine *A. minimus* var. *flavirostris*, Ludl. [xx, 235], and the author adopts this name for the form in question. As a result of an examination of specimens from the Netherlands Indies and comparison with descriptions of the forms from the other localities indicated, descriptions are given of the distinguishing characters of the adults and larvae of *A. aconitus* (Java), *A. minimus* (Sumatra, Celebes, Moluccas), *A. minimus* var. *flavirostris* (Java), *A. mangyanus*, Banks (Philippines), *A. filipinae* Mnlg. (Philippines), *A. varuna* (India), *A. fluviatilis*, James (*listoni*, List.) (India) and *A. funestus*, Giles (Africa).

SENIOR WHITE (R.). **Notes on a brief Tour in Malaya.**—*Ind. Med. Gaz.*, lxvii, no. 12, pp. 683–690, 15 figs. Calcutta, December 1932.

The author briefly describes the topography of Malaya and the distribution of population, and points out that the scattered agricultural villages that are typical of India are practically non-existent, and the malaria problem is one of commercial plantations and towns. The only malaria vectors of importance are *A. maculatus*, Theo., *A. umbrosus*, Theo., and *A. sundaicus*, Rdnw. (*ludlowi*, auct.), each of which has a well-defined and limited breeding region. Under natural conditions, the tidal area is densely covered with mangrove and no Anophelines occur, but if it is cleared enough to admit light, *A. sundaicus* breeds in the region between the neap and spring tide levels,

which, owing to the flat nature of the coastal plain, may be over a mile wide. From the limit of the tidal area to the base of the hills, the land is covered with almost impenetrable jungle overhanging a swamp with clear, brown water in which *A. umbrosus* is found. At the base of the hills (which may be only rocky outcrops under 100 ft. high or the true edge of the foothills) the ground becomes dry and the swamp is replaced by streams and a clear seepage line. This zone, which is almost, if not quite as dark as the previous one, is harmless until clearing admits sunlight, when *A. maculatus* begins to breed and it may become malarious up to an altitude of 5,000 ft.

The distribution of *A. sundaicus* is irregular, and it does not occur in large areas of the coastal zone that appear to be suitable. Malaria due to this species is usually epidemic in character and follows a sudden increase in the number of breeding-places. K. B. Williamson states that it is more dangerous the further it flies from its breeding ground, for the adults die rapidly if forced to drink their own breeding water, but if they obtain access to fresh water they live longer and more are likely to survive until the malaria parasites reach the infective stage. On one estate, where drainage against *A. umbrosus* has been carried out, the drains seem to be naturally oiled by some substance apparently emanating from the moss growing on their sides. Improvements in drainage systems are discussed.

Work on the control of *A. maculatus* in streams is being carried out by Williamson. In one case, a system of periodic flushing has been installed in which the gates are made from packing cases and are very cheap to construct. In another, the beds of certain streams have been treated with a local white china clay, for water flowing over this material has been found to be naturally sterile. Another stream was converted by means of tree-trunk dams into a series of pools with miniature waterfalls. The pools were partly filled with manure and leaf mould from the forest, and Nymphaceae and *Utricularia* were introduced ; as a result *A. maculatus* has been replaced by *A. hyrcanus* var. *sinensis*, Wied., and *A. barbirostris*, Wulp.

WEBSTER (W. J.). **Notes on the Study of Plague in the Field.**—*Ind. Med. Gaz.*, lxvii, no. 12, pp. 693–696, 8 refs. Calcutta, December 1932.

Much of the information required by field workers on plague is in voluminous reports or in different periodicals that are not readily available, and this paper has been compiled with a view to collecting data on various practical points about most of which enquiries have been received from time to time. Paragraphs are included on the collection and identification of fleas and their examination for plague infection.

HOLDAWAY (F. G.) & SMITH (H. F.). **A Relation between Size of Host Puparia and Sex Ratio of** *Alysia manducator* **Panzer.**—*Aust. J. Exptl. Biol. Med. Sci.*, x, pt. 4, pp. 247–259, 3 graphs, 16 refs. Adelaide, 16th December 1932.

The following is the authors' summary : A relation has been established between size of host [blow-fly] puparia and sex ratio of the Braconid parasite, *Alysia manducator*, Panz. Small puparia produce a high proportion of males, large puparia a high proportion of females. The relation between volume of puparia and sex ratio can be described (within the limits of the observations recorded) by a straight line.

MONTEIRO (J. LEMOS). **Typho endemico de S. Paulo.** [Endemic Typhus of S. Paulo.]—*Brasil-med.*, xlv, no. 47, pp. 1096–1100, 15 refs.; no. 48, pp. 1109–1113, 6 figs., 8 refs.; no. 49, pp. 1140–1142; no. 50, pp. 1163–1165; no. 51, pp. 1188–1190, 11 refs. Rio de Janeiro, 1931.

MONTEIRO (J. LEMOS), DA FONSECA (F.) & PRADO (A.). **Typho endemico de S. Paulo.**—*Op. cit.*, xlvi, no. 3, pp. 49–52, 5 refs. **Typho exanthematico de S. Paulo.** [Exanthematic Typhus of S. Paulo.]—*T.c.*, no. 8, pp. 169–172, 10 refs; no. 9, pp. 193–195, 8 refs., 1932.

MONTEIRO (J. LEMOS). **Typho exanthematico de S. Paulo.**—*T.c.*, no. 16, pp. 361–362, 5 refs.; no. 17, pp. 385–390, 13 refs.

MONTEIRO (J. LEMOS) & DA FONSECA (F.). **Typho exanthematico de S. Paulo.**—*T.c.*, no. 48, pp. 993–995, 3 refs.; no. 50, pp. 1029–1033, 15 refs.

The first of these papers (xlv, pp. 1096–1100) describes briefly the forms of typhus and allied fevers recorded in America, and the forms occurring in different parts of the world are listed in a table, showing their serological relations, distribution and known vectors. In Brazil the first record of an infection of this type was made in 1929 in S. Paulo, where cases of a disease termed S. Paulo exanthematic typhus occurred with clinical, epidemiological, and experimental characters distinctive from those of the classic typhus of the Old World. The second paper (pp. 1109–1113) deals with the experimental behaviour of the virus and states that a mortality of 77·2 per cent. attended the 44 cases in S. Paulo. Nearly 70 per cent. of inoculated guineapigs died, and peritoneal inoculation produced scrotal inflammation. In *Mus* (*Epimys*) *norvegicus* the reaction was slight. The third paper (pp. 1140–1142) describes experiments with monkeys, the fourth (pp. 1163–1165) records infection by inoculation in the eyes of animals, and the fifth (pp. 1188–1190) deals with the filterability of the virus and its resistance to the action of glycerine, desiccation and freezing.

The sixth paper (xlvi, pp. 49–52) describes experiments with ticks and guineapigs. Injections of suspensions of crushed ticks showed that *Amblyomma cayennense*, F., acquires the infection by feeding on an infected guineapig and that it is retained in larvae from eggs laid by an infected female. The infection produced by injecting the larvae was inapparent, but was proved by subinoculations of brain-material. The single attempt at infection with *Argas persicus*, Oken, failed. One example of *Ornithodorus rostratus*, Arag., transmitted the disease by biting, though several others failed to do so. It caused infection 13 days after the infecting feed but failed to do so after 28 days. Injection of its coxal fluid produced an immunising, benign infection. The seventh paper (pp. 169–172) suggests the name of *Rickettsia brasiliensis*, sp. n., for the causal agent of the disease and records unsuccessful attempts to produce infection in guineapigs by peritoneal injection of crushed specimens of the following possible vectors in S. Paulo: *Pediculus capitis*, DeG., *Pulex irritans*, L., and *Cimex lectularius*, L. (all taken from human cases or from the sick room); *Xenopsylla cheopis*, Roths., *X. brasiliensis*, Baker, *Leptopsylla segnis*, Schönh. (*Ctenopsylla musculi*, Dug.), *Ceratophyllus fasciatus*, Bosc, and *Craneopsylla minerva*, Roths., from rats; *Ctenocephalides felis*, Bch., from rats, cats and dogs; *Linognathus piliferus*, Burm., *Amblyomma ovale*, Koch,

and *Rhipicephalus sanguineus*, Latr., from dogs; larvae of *Boophilus annulatus microplus*, Can.; and the mites, *Echinolaelaps echidninus*, Berl., and *Laelaps nuttalli*, Hirst, from rats, *Liponyssus bacoti*, Hirst, from rats and the Brazilian opossum (*Cavia aperea*), and *L. bursa*, Berl., from gallinaceous birds. The eighth paper (pp. 193–195) describes experiments in inoculation of guineapigs with brain-material from *Mus norvegicus* from the urban and suburban (rural) zones of S. Paulo. The only positive result with rats from the latter zone was the production of a latent but immunising infection in one guineapig. Though this rat may possibly be a reservoir of the virus in the suburban zone, other rodents are probably also involved, since few fleas were taken on it and *L. bacoti*, which is a carrier of typhus in North America, was almost absent. On the other hand, there was a heavy infestation by *L. bacoti* of *Cavia aperea*, which was abundant in the suburban zone. A virus obtained from the urban rats is further discussed below. The ninth and tenth papers (pp. 361–362, 385–390) deal respectively with the status and relationships of diseases of the typhus group and the species of *Rickettsia* and with the various characters and properties of *Rickettsia brasiliensis*.

The eleventh paper (pp. 993–995) describes further work with *B. annulatus microplus* and *A. cayennense*, which are both common in the region of endemic infection in S. Paulo. All the results with *B. annulatus microplus* were negative except one in which a guineapig acquired infection when inoculated with two female ticks 13 days after their infecting feed. Of 5 experiments with *A. cayennense*, positive results were obtained in 2 by inoculation of crushed ticks, in 1 out of 2 by biting, and in 1 in which eggs laid by an infected female were inoculated. Smears from these eggs showed micro-organisms similar to *Rickettsia*, possibly symbionts. *A. cayennense*, which attacks man, is therefore regarded as the most probable vector, as it inherited the infection and transmitted it by biting. *Rickettsia brasiliensis* occurred in stained sections of this tick. The last paper (pp. 1029–1033) discusses the virus isolated from rats of the urban zone of S. Paulo. Its behaviour in guineapigs was different from that of the virus of exanthematic typhus from patients in S. Paulo, most of whom lived in the suburban or rural zone, and cross-immunity tests showed it to be distinct from the latter. The name *Rickettsia muricola*, sp. n., is suggested for it.

DURAND (P.). **Rôle du chien comme réservoir de virus dans la fièvre boutonneuse.**—*Arch. Inst. Pasteur Tunis*, xxi, no. 2, pp. 239–250, 1 fig., 4 graphs, 5 refs. Tunis, 1932.

Details are given of experiments showing that puppies 1½–2 months old reared under tick-free conditions can harbour the virus of Marseilles fever without showing any signs of disease [*R.A.E.*, B, xx, 101]. In order to test the theory that the failure of previous experiments was probably due to the almost constant immunity of dogs in a country where *Rhipicephalus sanguineus*, Latr., is prevalent, further experiments were undertaken at Lyons where this tick is not known to occur. Two dogs (2½ and 8 months old respectively) were inoculated with an emulsion of ticks obtained from Tunis and although they showed no signs of disease, typical symptoms were induced in two persons inoculated with their blood.

[VASIL'EV] WASSILIEFF (A.). **Les rongeurs et les puces de la Tunisie et leur rôle dans la propagation de la peste (II. Révision des rongeurs de Tunisie—III. Révision des puces).**—*Arch. Inst. Pasteur Tunis,* xxi, no. 2, pp. 298–340, 2 pls., 3 figs., 1 fldg. diagr., 1 fldg. map, 6 refs. Tunis, 1932.

In connection with investigations undertaken to determine the reservoir of plague in Tunisia during periods between outbreaks [*cf. R.A.E.*, B, xix, 200 ; xx, 146], the author made a study of the wild animals, particularly rodents, and their relations with man. Notes are given on the distinguishing characters of the species encountered and their habits and distribution are discussed.

A list is also given of the 19 species of fleas collected from the rodents and their burrows. The fact that the life and reproductive capacity of fleas depend on the humidity of the soil was confirmed ; during the dry season, few fleas were found in European habitations, and the constant presence of *Pulex irritans*, L., in huts was probably due to the native habit of sprinkling the floors for coolness. Experiments with *Stenoponia insperata*, Weiss, showed that it does not readily bite man and consequently takes little part in the transmission of plague. *Xenopsylla nubicus*, Roths., which is an African species corresponding to *X. astia*, Roths., in Asia, is recorded for the first time in Tunisia, where it was taken on *Psammomys roudairei*. The number of fleas on rats in the town of Tunis is not excessive but in exceptional cases 435 and 712 individuals of *X. cheopis*, Roths., were taken on two *Mus norvegicus* (*Epimys decumanus*) caught in houses.

It was found that the fauna of the extreme south of Tunisia, where plague is unknown, differs from that of the plague-infected central region ; in the most important focus it consists chiefly of *Meriones*, and there appears to be a relation between the incidence of plague and the multiplication of these rodents. The appearance in Tunisia of large numbers of rodents at one time has usually been attributed to invasions from Tripoli rather than to a local increase, but the author points out that animals fleeing from a focus of infection spread in all directions, and a flight in one direction only has never been observed. Moreover, epizootics and epidemics also radiate outwards. The finding in rodent burrows of objects such as pieces of cloth, etc., indicate that wild rodents frequently invade human habitations. Thus, it is possible that the spread of plague to the north is brought about by the accidental transport of infected wild rodents in the baggage of nomads. If, at the same time, there is an increase of rodents in the region to which the reservoir is taken, an outbreak of plague in rodents and man is easily explained. It was also noted that some epizootics are very restricted, and may be limited to a single dwelling. The part played by fleas in the transmission of plague is discussed, and the importance of the finding of rodent fleas in dwellings [xx, 147] and their immediate vicinity is emphasised.

BADGER (L. F.). **Rocky Mountain Spotted Fever (Eastern Type). Virus recovered from the Dog Tick** *Dermacentor variabilis* **found in Nature.**—*Publ. Hlth. Rep.*, xlvii, no. 53, pp. 2365–2369, 3 refs. Washington, D.C., 30th December 1932.

A number of individuals of *Dermacentor variabilis*, Say, were collected from a farm in Virginia where a case of the eastern type of

Rocky Mountain spotted fever [*R.A.E.*, B, xix, 195] had occurred. The virus of the disease was obtained from a guineapig on which several of these ticks had fed, and from guineapigs inoculated with an emulsion of one of the engorged ticks. There was a complete cross-immunity between the virus obtained and the eastern and western types of Rocky Mountain spotted fever, but none between it and the viruses of endemic and epidemic typhus.

Rees (C. W.). **The Experimental Transmission of Anaplasmosis by** *Dermacentor andersoni*.—*Parasitology*, xxiv, no. 4, pp. 569–573, 6 refs. Cambridge, January 1933.

In this paper, details are given of the experiments showing that *Dermacentor venustus*, Banks (*andersoni*, Stiles) is a vector of anaplasmosis of cattle in the United States [*R.A.E.*, B, xx, 273]. The disease was transmitted to susceptible animals by nymphs and adults infected as larvae and nymphs respectively, but not by larvae that were the offspring of ticks engorged as adults on infected cattle.

Ford (N.). **Observations on the Behaviour of the Sarcophagid Fly,** *Wohlfahrtia vigil* (**Walk.**).—*J. Parasit.*, xix, no. 2, pp. 106–111, 6 refs. Baltimore, Md., December 1932.

Detailed observations were made by the author in Toronto on two males and a female of *Wohlfahrtia vigil*, Wlk., reared from larvae extracted from lesions of cutaneous myiasis in an infant [*cf. R.A.E.*, B, xx, 47, etc.]. The female lived 53 days and the males 10–17. The flies showed no interest in the fresh or decomposing liver that was kept in the cage throughout the experiment but would feed all day on sugar. The female paired 3 days after emergence and from the eighth day a guineapig or a rabbit was placed in the cage for periods of ½, 1 or 2 hours at a time. On the first day the fly paid no attention to a guineapig or to a half-grown rabbit, although the back of the latter had been shaved and abrasions made in the skin. From the second day, however, the fly repeatedly attempted to attack the face or head of the animal, particularly the eye, and on the eighth day after pairing deposited a number of larvae close to the eye of a guineapig. The active maggots quickly disappeared among the long hairs, but several were scratched off by the animal and 4 were placed on liver. From this time the female showed only occasional interest in the animals and made no further attempt to deposit larvae. Pairing took place for the second time 7 days after the emergence of a male of the second generation reared in liver, when the female was 41 days old. On the 45th day the old fly appeared to rejuvenate and from the 46th day again became interested in the laboratory animal. After repeated attempts to strike the restive animal, larvae were eventually deposited on the 49th and 50th days on pieces of liver, after which all interest in the animals or liver ceased. The attempts of a larva to pierce the under-arm skin of a man were unsuccessful. The mortality among the larvae on liver was high, indicating that it is not a suitable rearing medium.

Hinman (E. H.) & Faust (E. C.). **The Ingestion of the Larvae of** *Tenebrio molitor*, **L.** (**Meal Worm**) **by Man.**—*J. Parasit.*, xix, no. 2, pp. 119–120, 13 refs. Baltimore, Md., December 1932.

Tenebrio molitor, L., is believed to be one of the commonest intermediate hosts of the rat tapeworm, *Hymenolepis diminuta* [*cf. R.A.E.*,

B, xix, 185], which has occasionally been found parasitising man. The authors record two cases of this beetle having been ingested by man. In one instance in 1929 a mature larva was vomited and in the other in 1930 an immature larva was found in a tonsil at tonsilectomy. Larvae and adults of *T. molitor* and *Tribolium ferrugineum*, F., were found in considerable numbers in an excellent state of preservation in the faeces of a number of experimental dogs that had been fed on calf meal. The facts that larvae of *T. molitor* occur frequently in human foods, that rats and mice are commonly associated with cereals, and that the larvae are at least occasionally ingested by man, suggest that they are responsible for the infestation of man by *H. diminuta*.

Papers noticed by Title only.

Miller (D.). **The Biology and Economic Status of New Zealand Muscidae and Calliphoridae.—Part I. Historical Review.**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 469–476, num. refs. London, December 1932.

Edwards (F. W.). **Mosquito Notes.—XI. (1.) A remarkable** *Uranotaenia* **Larva from Hong Kong. (2.) A new** *Theobaldia* **from the Azores. (3.) New African Culicines.**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 559–562, 1 fig. London, December 1932.

Mer (G.). **The Determination of the Age of** *Anopheles* **by Differences in the Size of the Common Oviduct.**—*Bull. Ent. Res.*, xxiii, pt. 4, pp. 563–566, 1 fig., 1 ref. London, December 1932.

Braga (J. M.). **Culicideos de Portugal.**—83 pp., 29 figs. Pôrto, Inst. Zool. Univ., 1931.

Johannsen (O. A.). **Ceratopogoninae from the Malayan Sub-region of the Dutch East Indies.**—*Arch. Hydrobiol.*, Suppl. ix, Bd. 2, pp. 403–448, 5 pls., 24 refs. Stuttgart, 1931. [Recd. January 1933.]

Enderlein (G.). **Einige neue paläarktische Tabaniden (Dipt.).**—*Mitt. deuts. ent. Ges.*, iii, no. 4, pp. 63–64. Berlin, April 1932.

Debot (L.). **L'appareil séricigène et les glandes salivaires de la larve de** *Simulium.*—*La Cellule*, xli, no. 3, pp. 205–216, 1 pl. Louvain, 1932.

Austen (E. E.). **The last larval Stage of** *Elephantoloemus indicus* **Austen (Diptera, Family Calliphoridae, Subfamily Calliphorinae), a subcutaneous Parasite of the Indian Elephant.**—*Proc. Zool. Soc. Lond.*, 1932, pt. 4, pp. 869–871, 2 figs., 1 ref. London, January 1933. [*Cf. R.A.E.*, B, xix, 20.]

Jobling (B.). **A Revision of the Structure of the Head, Mouth-part and Salivary Glands of** *Glossina palpalis* **Rob.-Desv.**—*Parasitology*, xxiv, no. 4, pp. 449–490, 5 pls., 11 figs., 33 refs. Cambridge, January 1933.

Miller (D.). **The Bucco-pharyngeal Mechanism of a Blow-fly Larva** (*Calliphora quadrimaculata* **Swed.).**—*Parasitology*, xxiv, no. 4, pp. 491–499, 12 figs., 8 refs. Cambridge, January 1933.

WARBURTON (C.). **On five new Species of Ticks (Arachnida Ixodoidea).** *Ixodes petauristae* [from Ceylon], *I. ampullaceus* [from Uganda], *Dermacentor imitans* [from Costa Rica], *Amblyomma laticaudae* [from Singapore] **and** *Aponomma draconis* [from Komodo Island, Netherlands Indies], **with Notes on three previously described Species,** *Ornithodorus franchinii* **Tonelli-Rondelli,** *Haemaphysalis cooleyi* **Bedford and** *Rhipicephalus maculatus* **Neumann.**—*Parasitology*, xxiv, no. 4, pp. 558–568, 1 pl., 7 figs. Cambridge, January 1933.

RONDELLI (M. T.). **Spedizione scientifica all'oasi di Cufra (Marzo-Luglio 1931). Ixodoidea.** [Scientific Expedition to the Oasis of Cufra, Libya, in March-July, 1931. Ixodoidea. (Annotated List of Ticks.)]—*An. Mus. civ. Stor. nat. Genova,* lv, pp. 369–373. Genoa, 23rd May 1932. [Recd. January 1933.]

RONDELLI (M. T.). **Presenza di** *Ornithodorus savignyi* **(Audouin) in Tripolitania.** [*O. savignyi* in Tripolitania. (A first record.)]—*Arch. ital. Sci. med. colon.*, xiii, no. 2, reprint 1 p. Modena, 1932. [Recd. January 1933.]

GALLI-VALERIO (B.). **Observations sur les Reduviidae** [including biological notes on *Eutriatoma* (*Triatoma*) *flavida,* Neiva, and *Reduvius personatus,* L.]—*Zbl. Bakt.*, (1) Orig., cxxvi, nos. 7–8, pp. 553–557. Jena, 23rd December 1932.

HASE (A.). **Ueber Starrezustände bei blutsaugenden Wanzen. i. Mitteilung betr.** *Panstrongylus* (*Triatoma*). [On cataleptic Positions in Blood-sucking Bugs. i. Contribution on *Panstrongylus*.]—*Naturwissenschaften,* xx, no. 51, pp. 967–971, 7 figs., 10 refs. Berlin, December 1932.

ARAKAWA (Y.). **On the Stink Glands and Poison in the Salivary Glands of the Bed-bug** [*Cimex*]. [*In Japanese.*]—*Oyo-Dobuts. Zasshi,* iv, pp. 198–200. Tokyo, September 1932.

ARAKAWA (Y.). **The Bite of the Bed-bug** [*Cimex*]. [*In Japanese.*]—*Insect Wld.*, xxxvi, no. 10, pp. 335–338. Gifu, October 1932.

EWING (H. E.). **The male genital Armature in the Order Anoplura or Sucking Lice.**—*Ann. Ent. Soc. Amer.*, xxv, no. 4, pp. 657–669, 9 figs., 6 refs. Columbus, Ohio, December 1932.

STILES (C. W.) & STANLEY (S. F.). **Key-Catalogue of Parasites reported for Insectivora (Moles, Shrews, etc.) with their possible Public Health Importance.**—*Bull. Nat. Inst. Hlth.*, no. 159, pp. 791–911. Washington, D.C., U.S. Pub. Hlth. Serv., 1932.

JORDAN (K.). **Two new American Species of Siphonaptera.**—*Entomologist,* lxvi, no. 836, pp. 14–17, 7 figs. London, January 1933.

DYER (R. E.), WORKMAN (W. G.) & RUMREICH (A.). **Endemic Typhus Fever Virus recovered from Wild Rat trapped at Typhus Focus in the United States.**—*Publ. Hlth. Rep.*, xlvii, no. 53, pp. 2370–2372, 9 refs. Washington, D.C., 30th December 1932.

HOFFMANN (C. C.). **Los scorpiones de Mexico. Primera Parte : Diplocentridae, Chactidae, Vejovidae. Segunda Parte : Buthidae.** [The Scorpions of Mexico. Parts I and II.]—*An. Inst. Biol. Univ. Mex.*, ii, no. 4, pp. 291–408, 43 figs. ; iii, no. 3, pp. 243–282, 20 figs. Mexico, 1931–32.

Boyd (M. F.) & Stratman-Thomas (W. K.). **A controlled Technique for the Employment of naturally induced Malaria in the Therapy of Paresis.**—*Amer. J. Hyg.*, xvii, no. 1, pp. 37–54, 6 refs. Baltimore, Md., January 1933.

A detailed account is given of the technique successfully used in Florida for the infection of paretics with malaria by means of mosquitos. Qualitative infection is defined as the proportion of the total Anophelines that becomes infected, whereas quantitative infection is the number of oöcysts that develop in individual mosquitos. Heavy quantitative infections (100 or more oöcysts) are suspected of being prejudicial to the mosquito. On the other hand, in infections producing only 10 oöcysts, the sporozoites are depleted too soon. A total of 15–20 has been found satisfactory. Experience has shown that every lot of mosquitos contains some that for unknown reasons are refractory to infection [*cf. R.A.E.*, B, xx, 37]. There does not appear to be any advantage in repeatedly exposing mosquitos to infection, as this does not produce 100 per cent. qualitative infection, and a larger proportion develops a high quantitative infection with its disadvantages. Ordinarily about 80 per cent. or more can be induced to ingest blood at the first opportunity for feeding.

Although infections with *Plasmodium vivax* have been induced in some patients by the insertion of the proboscis of a single mosquito that drew no visible blood, and in many other patients by a single mosquito that engorged, in order to be certain that the patient will develop a clinical attack of malaria extending over several weeks, the authors consider that two infected mosquitos should be applied. The application of more than two does not appear to be of any advantage unless subsequent examination of the salivary glands of the mosquitos applied shows that the sporozoite content has been greatly depleted. Large, dark, well-chitinised mosquitos, with uninjured legs and wings, that are not gravid and have no remnant of a previous blood meal visible in the abdomen are most likely to feed.

Matheson (R.). **Medical Entomology.**—Med. 8vo, xiv+489 pp., 6 portr., 211 figs. London, Baillière, Tindall & Cox, 1932. Price 29*s*.

In this book, a comprehensive survey is made of present knowledge on all important Arthropods connected with human disease or causing discomfort to man. A short historical summary is given of the discovery of the transmission by Arthropods of various diseases, with a list of the more important journals in which work on this subject is published. The classification of Arthropods is discussed, with keys to the orders of the class Arachnida and the sub-orders and superfamilies of the order Acarina. As regards the Insecta, special attention is given to the characters, anatomy and general biology of the four orders of greatest importance to the medical entomologist, *viz.* :—Rhynchota, Anoplura, Diptera and Siphonaptera. Information is also given on poisonous and urticating Arthropods, and suggestions are made for the collection, preservation and mounting of insects, with special reference to those that are sent for identification. The book contains both author and subject indices, and at the conclusion of each chapter is given a list of references in which those with extensive bibliographies are especially marked.

Wigglesworth (V. B.). **The Effect of Salts on the Anal Gills of the Mosquito Larva.**—*J. Exp. Biol.*, x, no. 1, pp. 1–15, 14 refs. **The Function of the Anal Gills of the Mosquito Larva.**—*T.c.*, pp. 16–26, 4 figs., 27 refs. **The Adaptation of Mosquito Larvae to Salt Water.** *T.c.*, pp. 27–37, 2 figs., 25 refs. Cambridge, January 1933.

The first two papers deal with the structure and reactions and the function of the anal gills of mosquito larvae as determined by experiments on the larvae of *Aëdes aegypti*, L. (*argenteus*, Poir.). It is concluded that these organs are primarily used for the absorption of water and are only incidentally concerned in respiration.

It is well known that larvae of certain mosquitos can thrive in fresh water and in water of a high degree of salinity, whereas those of others are rapidly killed by salt water; moreover such differences may exist even between local races of the same species [*cf. R.A.E.*, B, xx, 64]. The experiments described in the third paper were undertaken with a view to determining the nature of the physiological adaptation involved, again using larvae of *A. aegypti*. Larvae reared in fresh water were killed by 1·1 per cent. NaCl or by "sea water" isotonic with 1·3–1·4 per cent. NaCl. The "sea water" used was an artificial solution in which the balance of metallic ions approximated to that of sea water. Newly hatched larvae were killed by 1·1 per cent. NaCl or "sea water" equivalent to 1·3 per cent. NaCl. By gradually increasing the concentration, larvae could be made resistant to 1·1 per cent. NaCl and to "sea water" equivalent to 1·75 per cent. NaCl (50 per cent. sea water). It is concluded that the elastic strands in the cells of the gills become exaggerated, and these cells resist swelling in hypertonic solutions. Moreover, there are changes in the epithelium of the mid-gut, so that the cells are no longer caused to swell up and become detached from the basement membrane, and the mid-gut and caeca can absorb the salt fluid and so avoid the excessive distension that occurs in unadapted larvae. It is possible also that the malpighian tubes excrete a more concentrated urine, and that the reabsorptive activity of the rectum is increased. The mosquito larva appears to be homoiosmotic in both fresh water and in hypertonic salt water.

MacLeod (J.). **The Use of Derris against the Sheep Tick.**—*Scot. J. Agric.*, xvi, no. 1, pp. 84–86. Edinburgh, 1933.

Experiments in Scotland in 1930 demonstrated that although the majority of ticks (*Ixodes ricinus*, L.) could be removed by dipping sheep thoroughly in an arsenical dip at a strength of 0·16 per cent. As_2O_3 or a carbolic dip at a strength of 0·35 per cent. phenol, neither of these dips could be relied on to kill all the ticks. Experiments were therefore carried out in 1931 to test the efficacy of derris, using a suspension of derris powder in water to which a soap solution was added, the strength of the dip solution being equivalent to 0·21 per cent. toxic extract. This was compared with a 0·2 per cent. arsenical dip, and a 0·35 per cent. carbolic dip. After 24 and 48 hours, several living ticks were found on all three groups of sheep, the greatest number being found on those dipped in carbolic. On the third day, living ticks were again found in the "carbolic group," one gorged female on the "arsenic group," and none on the "derris group." Derris has the advantage that sheep can be repeatedly dipped at short intervals without suffering serious ill effects such as are associated with the repeated use of the other two dips. A further experiment showed that it retained most of its toxicity

for at least 4 days ; although it was not so toxic as the fresh dip, it was apparently almost as effective as fresh solutions of arsenic and carbolic. It was also found that a solution prepared from a mixture of derris with soap powder was an equally effective dip.

Cummings (B. F.). **The Bed-bug. Its Habits and Life-history and how to deal with it.**—*Econ. Ser. Brit. Mus.* (*Nat. Hist.*), no. 5 (3rd edn.), 27 pp., 7 figs., many refs. London, 1932. Price 2*d.*

This pamphlet on the bionomics and control of *Cimex lectularius*, L. (common bed-bug) is a revision by Major E. E. Austen of one originally published in 1917 and practically reprinted in 1918, and contains much new information taken from recent literature.

Jameson (G. D.). **An Experiment to Exterminate Bugs from Infested Buildings.**—*J. Roy. Army Med. Cps.*, lx, no. 2, pp. 138–139. London, February 1933.

In May 1931, the number of bugs [*Cimex*] in a barrack room in Gibraltar was considerably reduced by placing a nest of a species of *Monomorium* (? *pharaonis*, L.) in the ceiling. The ants preyed on the bugs but eventually disappeared, probably because the numbers of the bugs were too diminished to afford an adequate supply of food. A similar experiment in August was not successful, as the ants rapidly disappeared. This was apparently due to the fact that a complete nest of ants is necessary. In Gibraltar, nests are usually built in inaccessible places, such as beneath a tiled floor, and it is therefore not easy to obtain complete ones. Moreover, it is difficult to ensure that the ants will remain in the site selected for any length of time. Care should be taken that other sources of food are not available.

Hecht (O.). **Experimentelle Beiträge zur Biologie der Stechmücken II.** [Experimental Contributions on the Biology of Mosquitos, II.]—*Z. angew. Ent.*, xix, no. 4, pp. 578–607, 44 refs. Berlin, December 1932.

This paper is one of a series [*cf. R.A.E.*, B, xix, 142]. Published observations on *Anopheles maculipennis*, Mg., indicate that temperature cannot be regarded as the prime factor in inducing hibernation. The author has studied in Germany the effect of temperature on blood ingested by females of this mosquito that were hibernating or beginning to hibernate. Females kept under warm conditions (about 29°C. [84·2°F.]) did not show any notable egg-growth after 1 or 2 blood meals. After 3 meals egg-growth and oviposition occurred in some individuals, but even after 4 meals, the eggs did not mature sufficiently for oviposition in all cases. Fat-body development, when present, was always slight. At a low temperature (11°C. [51·8°F.]) no development of the ovaries occurred even after 5 meals, and fat-body development was observed. At 18–20°C. [64·4–68°F.] there was no growth of the ovaries even after 6 meals, and the condition of fat-body development was mid-way between that of the individuals kept at the warm and cold temperatures. The conditions of hibernation and semi-hibernation characteristic of various regions were induced by temperature variation, but as even at high temperatures with one or a few meals, there was never any rapid egg-development in all individuals, these laboratory experiments confirmed the reduction, characteristic of winter individuals, of the connection between blood-digestion and egg-maturation.

In the case of *Culex pipiens*, L., hibernation always appears to be the result of low temperature. In experiments with two German strains of *C. pipiens* the ingested blood seemed always to be utilised for egg-growth, even at low temperatures, so that eggs were laid in all seasons. Oviposition without a blood-meal only occurred when the larvae had been well nourished. Contrary to expectation, it was chiefly adults from larvae bred at higher temperatures (22 and 28°C. [71·6 and 82·4°F.]) that oviposited in this manner. This oviposition occurred in winter and in summer. The resultant rafts contained a comparatively small number of eggs [*cf.* xxi, 46], from 25 to 174 being observed as compared with 200–300 with blood meals. Several generations were bred without a blood meal, and no feeding of the adults with sugar-water, etc., was necessary. Without a blood meal females oviposited once only, but if such females were given a subsequent blood meal they oviposited a second time, and further meals resulted in further ovipositions.

In experiments on the thermotropism of *C. pipiens* in oviposition [*cf.* xix, 142], it was found that water between 20 and 30°C. [68 and 86°F.] was preferred, and chiefly that towards the higher temperature. Eggs were hardly ever laid at temperatures over 32°C. [89·6°F.] or under 18°C. [64·4°F.].

Regendanz (P.) & Reichenow (E.). **Die Entwicklung von *Babesia canis* in *Dermacentor reticulatus*.** [The Development of *B. canis* in *D. reticulatus*.]—*Arch. Protistenk.*, lxxix, no. 1, pp. 50–71, 2 pls., 1 fig., 15 refs. Jena, 4th January 1933.

Previous work on the development of piroplasms in ticks is briefly reviewed [*cf. R.A.E.*, B, xx, 82, 137], and an account is given of investigations on the development of *Piroplasma* (*Babesia*) *canis* in *Dermacentor reticulatus*, F., carried out in continuation of studies on transmission [xx, 184]. The first piroplasms were seen in the blood of a dog 6–7 days after infected nymphs or adults were placed on it. They increased rapidly. The same tick that had communicated the infection to the dog re-ingested the parasites from its blood. Most of the parasites perished in the gut, and shortly after the ticks had dropped off those in the lumen of the gut disappeared entirely. The remainder penetrated the epithelial cells of the gut and then migrated from the gut wall to the body cavity, entered the ovary and infested the eggs. There was no further development of the piroplasms in the young ticks until they entered the cells of the salivary glands of the nymphs. They began to increase when the nymphs began feeding and were discharged into the lumen of the alveolae of the salivary glands and reached the dog with the saliva [*cf.* xx, 184]. Most of the piroplasms, however, entered the salivary glands later and did not develop there until the adult began feeding.

Harrison (C. C.) & Ramsay (G. C.). **Some Findings and Observations in a Malaria Survey of a Group of Tea Estates in the Eastern Duars District of Northern Bengal and some Recommendations for the Reduction, Control and Eradication of Malaria in the Area investigated.**—*J. Trop. Med. Hyg.*, xxxvi, no. 3, pp. 33–41, 1 map, 1 graph, 1 ref. London, 1st February 1933.

In this survey 16 species of Anophelines were collected, though dissection showed only *Anopheles minimus*, Theo., to be infected with

malaria parasites, the rate being 6·63 per cent. The first infected individual was taken on 10th May when the minimum night temperature had been above 60°F. since 20th April, and the last on 14th December although the night temperatures fell below 60°F. on 7th November. Malaria transmission does not appear to occur, except in artificially heated habitations, after the minimum night temperatures have dropped below 60°F., and it is suggested that as low temperatures inhibit feeding, the infected Anophelines caught after 7th November probably became infected before that date. Examination of 723 individuals of *A. maculatus*, Theo., revealed no infections, and it is suggested that zoophilism may be responsible for this result, as this species has recently been found infected in a hill station in Assam, where cattle in relation to the human population are comparatively scarce. During the cold season and the dry part of the hot season, *A. minimus* bred in the grassy edges of those parts of the rivers where the stream is perennial, but during the rainy part of the hot season the water becomes contaminated with silt [*cf. R.A.E.*, B, xix, 76]. It then migrates to the clear or very slightly cloudy water of the smaller streams or channels, particularly those with grassy edges, either unshaded or imperfectly shaded, in or leading to artificially irrigated rice fields. It was frequently found in the clear stagnant water of borrow-pits with grassy edges, in brick-fields, in the tea section drains, in seepages and in swamps. It was rarely found in water more than one mile distant from human habitations, showing that proximity of food-supply plays a definite part in the selection of breeding-places.

For the control of malaria on these estates, the usual measures are recommended.

Knowles (R.) & Basu (B. C.). **The Nature of the so-called "Black Spores" of Ross in Malaria-transmitting Mosquitoes.**—*Ind. J. Med. Res.*, xx, no. 3, pp. 757–776, 4 pls., 33 refs. Calcutta, January 1933.

In the course of work on malaria transmission in Calcutta, the authors not infrequently encountered the "black spores of Ross" in infected individuals of *Anopheles stephensi*, List. From a study of their own material in sections, and of Bruce Mayne's paper [*R.A.E.*, B, xvii, 254] and the literature to which he refers, they conclude that the confusion at present existing as to the nature of the "black spores" is due to the fact that different observers have been dealing with three different structures under that name. The true "black spores of Ross" would appear to be degenerated and hyper-pigmented malaria oöcysts, which may be either intact with the investing membrane unbroken, or ruptured with the contents scattered. Such structures may possibly behave as foreign bodies in the tissues of the mosquito and may subsequently become chitinised. The forms on which Mayne based his conclusion that the "black spores" have no connection with malaria parasites appear to be "chitin corpuscles," which consist of the hyper-chitinisation of localised portions of the finer ramifications of the tracheal system. The third structure consists of fungous infections of the tracheal system of the mosquito, possibly in some cases associated with hyper-chitinisation. An account is given of the occurrence of "black spores" in infected individuals of *A. stephensi* that had fed on patients with infections of *Plasmodium malariae* and *P. falciparum*. The process of evolution of these degenerating and hyper-pigmented cysts is described and illustrated.

STRICKLAND (C.), ROY (D. N.) & CHAUDHURI (H. P.). **A Year's Observations in Calcutta on the Invasion of the Salivary Glands of *Anopheles stephensi* by malarial Sporozoites, and the Influence of some climatic Conditions.**—*Ind. J. Med. Res.*, xx, no. 3, pp. 819–840, 3 charts, 6 refs. Calcutta, January 1933.

Observations in Calcutta on salivary gland infections in *Anopheles stephensi*, List., fed on malaria patients and subsequently kept under " natural " conditions in the laboratory, were carried out from January 1931 to February 1932. A period of heavy infection occurred from October or November to January (90 per cent. of the mosquitos being infected), a period of non-infection from March to July or August (only 0·7 per cent. being infected) and two periods of transition in September and February, when the infection rates were 44 and 74 per cent. respectively. The two main periods correspond to the cold weather and the hot weather. The infection rate was found to be inversely correlated with high maximum temperature, and somewhat less exactly with high minimum temperature, whereas the influence of minimum relative humidity was not clear. During the period November to January, the maximum temperature was 80–87°F., the minimum 62–66°F., the mean relative humidity 66–70 per cent. and the minimum 32–43 per cent. From March to July the corresponding figures were 89–106 and 62–80°F., and 45–85 and 30–80 per cent. ; and during the intervening periods, they were 80–96 and 62–80°F., and 63–85 and 32–70 per cent. The coefficients of correlation were worked out, and it was then discovered that not only the maximum and minimum temperatures, but also the minimum and mean relative humidities had a significant and inverse influence on the infection rate, in descending order of importance. The partial correlation of infection with minimum relative humidity when both maximum and minimum temperatures were constant showed a significant value for the influence of humidity.

A gametocyte-count of 120 per cu. mm. of blood or over showed a potential infectivity of 100 per cent. Below this density there was a gradual decrease in infectivity. Both *Plasmodium vivax* and *P. falciparum* were 100 per cent. infective. *P. malariae* had, within the limits of the observations made, an 82 per cent. infectivity, but the authors consider that it probably does not differ from the other species in this respect.

They conclude that the development of the malaria parasite in *A. stephensi* in Calcutta (and in other species according to the data of other workers) has a fixed relationship to physical conditions ; that humidity is not a negligible factor ; and that temperature is also important, too high a temperature completely inhibiting infection. On the other hand, they point out that whatever the absolute value of a factor, its effect may be rendered negligible by the operation of other factors. Thus, although 100 per cent. infectivity was obtained in the cold weather in *A. stephensi*, the commonest Anopheline in Calcutta, this high rate was not reflected in the incidence of malaria according to the records of 3 hospitals for 10 years.

IYENGAR (M. O. T.). **Experimental Infection of Anopheline Mosquitoes.** *Ind. J. Med. Res.*, xx, no. 3, pp. 841–861, 6 refs. Calcutta, January 1933.

During 1930 and 1931, experiments were undertaken in Calcutta in which laboratory-bred Anophelines were allowed to feed on malaria

patients. *Anopheles stephensi*, List., *A. varuna*, Iyen., *A. aconitus*, Dön., *A. annularis*, Wulp (*fuliginosus*, Giles), *A. minimus*, Theo., *A. jamesi*, Theo., and *A. sundaicus*, Rodenw., were susceptible to infection with *P. falciparum*, the first five together with *A. hyrcanus* var. *nigerrimus*, Giles, to infection with *P. vivax*, and the first two together with *A. sundaicus* and *A. culicifacies*, Giles, to infection with *P. malariae*. *A. annularis* appeared to be least susceptible to *P. falciparum* and *A. hyrcanus* var. *nigerrimus* to *P. vivax*. Sporozoites of *P. malariae* were observed in the salivary glands of *A. sundaicus* and *A. stephensi*. Among the gametocyte-carriers, 67·6 per cent. of those infected with *P. falciparum* proved infective to the mosquitos, 40 per cent. of those infected with *P. vivax* and 21·2 per cent. of those infected with *P. malariae*. This variation in infectivity appears to be related to the " quality " rather than the quantity of gametocytes present in the blood of the patient [*cf. R.A.E.*, B, xix, 118 ; xxi, 43]. Feeding mosquitos on fruit had no inhibitory influence on the formation or development of oöcysts.

Abraham (A. C.). **The Anopheline Mosquitoes of Hyderabad, Deccan, and their Control.**—*Rec. Malaria Surv. India*, iii, no. 2, pp. 179–189, 1 map, 2 graphs, 9 refs. Calcutta, December 1932.

An account is given of investigations on the incidence and control of malaria in the City of Hyderabad, which included a systematic Anopheline survey begun in January 1930 and both field and laboratory observations. The species of *Anopheles* collected were *A. stephensi*, List., *A. aconitus*, Dön., *A. culicifacies*, Giles, *A. subpictus*, Grassi, *A. annularis*, Wulp (*fuliginosus*, Giles), *A. pallidus*, Theo., *A. minimus*, Theo, *A. fluviatilis*, James (*listoni*, List.), *A. hyrcanus*, Pall., *A. barbirostris*, Wulp, *A. vagus*, Dön., and *A. tessellatus*, Theo., of which the first three appear to be the important vectors of malaria. In addition to such breeding-places as the river, reservoirs, ponds and wells, Anophelines were found in earthenware pots that are thrown away in the fields and elsewhere. Observations on seasonal occurrence, based chiefly on collections of larvae, show that *A. hyrcanus* and *A. barbirostris* appear towards the end of September, increase in numbers and disappear again in February. *A. culicifacies* appears towards the middle of June, is prevalent from July to October and disappears during the last weeks in November. *A. aconitus*, *A. minimus* and *A. fluviatilis* appear towards the end of November, occur in large numbers from January to April and disappear in May. *A. stephensi* breeds throughout the year, but seems to be most active from June to September.

Although the area north of the River Musi is abundantly supplied with water and contains extensive breeding-places, the degree of malaria infection is moderate (spleen rate 10–25 per cent.). On the south side of the river, in the city proper, however, the malaria incidence is high (spleen rate over 50 per cent.), and this is believed to be due to the numerous wells in which *A. stephensi* breeds and to the poorly built houses and overcrowding, which provide shelter for mosquitos and increase the possibilities of infection. There are two periods when malaria is particularly prevalent, February–May and July–October. Of the small number of mosquitos dissected, only *A. stephensi* was found to be infected (3·5 per cent.), but from observations on breeding-places and seasonal prevalence, the author concludes that the first increase in malaria is due to *A. aconitus* and the second to *A. culicifacies*. The usual anti-larval measures, including the covering or filling in of wells,

canalisation and drainage, the prohibition of the excavations of sand from the river bed and of the wet cultivation of rice within the city boundaries, are recommended. In an appendix dealing with water hyacinth (*Eichornia crassipes*), the author points out that this plant, which grows densely in the river, not only shelters both adult and larval mosquitos but also mechanically interferes with the action of larvicides, and it is suggested that this difficulty might be overcome if it were utilised as manure and cattle fodder.

RAMSAY (G. C.) & CARPENTER (J. A.). **An Investigation of Petroleum Oils for Malaria Control Purposes.**—*Rec. Malaria Surv. India*, iii, no. 2, pp. 203–218, 8 refs. Calcutta, December 1932.

The larvicidal properties of different petroleum oils vary greatly, and research work was therefore undertaken on the chemical, physical and toxic actions of the various petroleum products available in India, with a view to obtaining a highly efficient oil for use in Anopheline control. The sources of oil, the composition of petroleum and its main fractions, and the physical properties of oils are discussed. An ideal anti-larval oil should yield a film that spreads well (when the oil is applied at a reasonable rate, *viz.*, 4–5 oz. per 100 sq. ft.) and persists for several days; its viscosity should be sufficiently low to enter the larval spiracles and to permit of effective spraying; it should wet and destroy vegetation and cover algae with oily "felting," thereby reducing the food-supply of the larvae; it should be highly toxic to mosquitos but not to fish, and must not affect animals or birds; and it should not be utilisable for illumination as otherwise it may be stolen by coolies.

The investigations were undertaken with sequences of oils from light to heavy, using ordinary straight distillates and residues of crude oil, specially prepared aromatic and cracked oils, and finally blends of these with heavy fuel oils.

From the results both in the laboratory and the field, it was found that for a given class, the more volatile and less viscous oil kills the larvae more rapidly but produces a less persistent film. Apart from the consideration of the chemical toxicity of specially prepared oils, the best compromise between volatility and persistence is found among oils of medium ranges after light products have been removed. Expressed in centipoises at 25°C. [77°F.], the viscosity should lie between 3 and 15 units, preferably nearer the lower limit. After adjusting such physical properties to correct ranges, the most satisfactory oil was obtained by blending aromatic and unsaturated oils extracted or produced from certain ranges or "ends" of oil. Those with boiling averages of 240–290°C. and viscosities of 3–6 (centipoises at 25°C.) gave results equal to or better than those obtained with ordinary light cuts of much lower range and viscosity, and at the same time they gave lasting films. They have good wetting and spreading powers and are abnormally toxic to weeds. They kill the majority of Anopheline larvae in 2–5 mins. as compared with half to one hour for ordinary oils, and kill even larvae of *Aëdes* (*Stegomyia*) in 20 mins. whereas ordinary oils require several hours. Moreover, unless they have been shaken vigorously with the water, fish under them are not killed. The effect of the addition of such substances as vegetable oils or acids, turpentine, creosote, oxidised aromatic bodies such as phenol and cresol, alkalies and tars has been studied, but nearly all of them increase the cost, and in most cases the increase in efficiency is not sufficiently marked to

make their inclusion worth while. Fatty acids may cause the first drop or two to spread quickly and partly dissolve, but the surface is then spoilt for the bulk of the oil, which remains in blotches. This is the effect of many substances that are soluble in both oil and water. Crude creosote is effective in scorching weeds and may be added at the rate of 2–5 per cent. ; such creosote should not be appreciably soluble in water so that when incorporated in the oil it will not injure fish unless swallowed. The method of applying sprays is discussed. A more satisfactory film is produced if the spray nozzle is directed upwards and not aimed directly at the water. The oil should be applied at the rate of about 4–5 oz. per 100 sq. ft. or sometimes more ; 1 gal. should cover about 250 yds. with a spray 1 ft. wide, in view of the fact that the oil will spread much more after it has reached the surface.

Experiments were also undertaken on the effect of de-aeration, silt and temperature on mosquitos. Larvae did not live for more than a few moments in water entirely free from oxygen, but drowning may be a slow process if air is dissolved in the water. If water in a pond is deficient in dissolved oxygen owing to the presence of certain fungoid organisms, even a non-toxic oil will cut off the surface air supply necessary for the continued existence of the larvae. The larvicidal action of silt was tested by introducing larvae of various species of Anophelines into jars containing water with a high percentage of silt kept turbid by the passage of a gentle stream of air bubbles ; 50 per cent. of the larvae died within 24 hrs., 90 per cent. in 48 hrs., 97 per cent. in 100 hrs. and all were dead within 110 hrs. When kept at 50°F., Anopheline and Culicine larvae were dead after 4 days, but 25 per cent. of the pupae had given rise to adults and 25 per cent. were alive. At 30°F., several larvae of *Aëdes* (*Stegomyia*) were alive after 8 hrs., but all were dead within 24 hrs. When ice-blocks were placed in water all larvae and pupae sank to the bottom as the temperature fell below 60°F. but, though many died of shock, several recovered when the ice melted and the water again reached 65–70°F. In experiments to test the effect of exposure to heat, all pupae died between 105 and 107°F., all larvae between 107 and 111°F. and all adults between 120 and 125°F.

RICE (E. M.) & SAVAGE (J. de la M.). **Malaria Survey of two Tea Estates in Upper Assam.**—*Rec. Malaria Surv. India*, iii, no. 2, pp. 219–252, 3 graphs, 5 refs. Calcutta, December 1932.

An account is given of malaria surveys of two tea estates in Upper Assam carried out from June to December 1931. Of the 17 species of *Anopheles* collected, only *A. minimus*, Theo., and *A. philippinensis*, Ludl., were found to be infected. The latter is a vector in Bengal but has not previously been reported as infected in Assam, and as only 1 out of 560 individuals dissected contained parasites and these were confined to the gut, it is possible that they do not develop further in this locality. *A. minimus*, which appears to increase in prevalence during the later months of the year, is therefore considered to be the principal vector. Further dissections are required to determine whether any other species is involved during the early part of the year, for if *A. minimus* alone is concerned, and then only at the end of the year, control measures may be limited to that species and to that time. The measures recommended include oiling, filling, etc., the weekly addition of cattle manure to small collections of water in borrow pits, and the preservation of ferns and other vegetation overhanging drains. An estimate of their cost is given.

GUPTA (P.), GHANASYAM DAS & MAJUMDAR (Nizamur Rahman). **A Malaria Survey of Kachugaon, Goalpara District, Assam.**—*Rec. Malaria Surv. India.*, iii, no. 2, pp. 253–268. Calcutta, December 1932.

In the course of a survey of Kachugaon and the surrounding villages, where the incidence of malaria is high, the following Anophelines were collected : *Anopheles minimus*, Theo., which is the principal if not the only vector in this locality and was the only species found to be infected, *A. vagus*, Dön., *A. hyrcanus* var. *nigerrimus*, Giles, *A. aconitus*, Dön., *A. barbirostris*, Wulp, *A. annularis*, Wulp (*fuliginosus*, Giles), *A. subpictus*, Grassi, *A. culicifacies*, Giles, *A. fluviatilis*, James (*listoni*, List.), *A. philippinensis*, Ludl., *A. maculatus*, Theo., and *A. kochi*, Dön. The first three species were by far the most numerous. Larvae of *A. minimus* were found chiefly at the extensive grassy margins of the Boriali River, and it is suggested that the river be dammed below the settlement in order to keep it full throughout the year and to expose larvae to the action of larvivorous fish, a list of 7 species of which is given. The banks should be cleared of grass and the destruction of small fish prohibited. The measures recommended include the use of Paris green in temporary breeding-places of *A. minimus*, the administration of plasmochin and the screening of residential quarters.

COVELL (G.). **A Further Note on Malaria in Patiala State.**—*Rec. Malaria Surv. India*, iii, no. 2, pp. 271–278, 1 map, 1 ref. Calcutta, December 1932.

An account is given of further observations on the malaria problem in Patiala State [*cf. R.A.E.*, B, xx, 196], carried out during August 1932. In addition to the Anophelines already mentioned, *Anopheles stephensi*, List., *A. pallidus*, Theo., and *A. pulcherrimus*, Theo., were collected in comparatively small numbers.

COVELL (G.) & BAILY (J. D.). **The Study of a regional Epidemic of Malaria in Northern Sind.**—*Rec. Malaria Surv. India*, iii, no. 2, pp. 279–322, 2 maps, 13 graphs, 36 refs. Calcutta, December 1932.

An epidemic of malaria occurred in northern Sind in the autumn of 1929, and a detailed account is given of observations made at Shikarpur immediately before, during, and for 8 months after, the outbreak. The cause was excessive monsoon rainfall accompanied by flooding, following a series of years of abnormally low rainfall. The relative atmospheric humidity was abnormally high prior to the epidemic. There had been no major outbreak of malaria in Sind since 1917, and the amount of communal immunity, as indicated by the results of spleen examinations, was generally at a very low level. *Anopheles culicifacies*, Giles, which is the most important vector in Sind [*cf. R.A.E.*, B, xx, 60, etc.], was numerous at the beginning of the outbreak, but there is evidence that very few adults emerged after the first few weeks. Infectivity in this species was high, the sporozoite rate reaching 30 per cent. During the decline of the epidemic, the sporozoites observed were abnormally sluggish.

The authors conclude that the period during which the active transmission of malaria takes place in northern Sind is normally not more than 6 weeks in length, but this may be increased by about 4 weeks in years when excessive rainfall occurs in the monsoon period. Moreover,

the increase in length of the period of high sustained relative atmospheric humidity that results is apparently the main factor in the production of an epidemic.

As a result of their observations, the authors emphasise the importance, in tracts subject to regional epidemics, of engineering operations designed to minimise the effects of flooding, and the necessity for arranging that adequate supplies of quinine be available in areas threatened by an outbreak, *i.e.*, where several years of deficient rainfall and low malaria incidence have been succeeded by abnormally heavy precipitation. With regard to temporary anti-larval measures, every effort should be concentrated against the breeding-places of the carrier species during the pre-epidemic period and the first few weeks of the epidemic. In the Punjab and northern Sind this period would be approximately from the beginning of July to the end of September; it is doubtful if control measures carried out after this period are of any great value, since the majority of the Anophelines concerned in the production of the epidemic have already emerged.

SINTON (J. A.). **Helminthic Infections in Indian Anopheline Mosquitoes.**—*Rec. Malaria Surv. India*, iii, no. 3, pp. 347–351, 24 refs. Calcutta, December 1932.

In this paper the author has collected the comparatively few records of infestations of adults and larvae of Indian Anophelines by immature stages of Nematode and Trematode worms, including observations in 1932 of larval Nematodes and encysted larval Trematodes in adult females of *Anopheles culicifacies*, Giles, and larval Nematodes in larvae of *A. gigas* var. *simlensis*, James & List., and *A. lindesayi*, Giles.

SERGENT (Ed.), PARROT (L.) & DONATIEN (A.). **Quelques observations sur la biologie des cératopogoninés d'Algérie.**—*Arch. Inst. Pasteur Algérie*, x, no. 4, pp. 466–470, 9 refs. Algiers, 1932.

Lists are given of the Ceratopogonids found on the coast of Algeria and in the Algerian Sahara [*cf. R.A.E.*, B, ix, 171; x, 50; xi, 172; xii, 110], with notes on their distribution, seasonal and daily activity and hosts. Several species feed on domestic animals, but only *Holoconops mediterraneus*, Kieff., is known to attack man.

SENEVET (G.). **Notes sur les moustiques.—I.**—*Arch. Inst. Pasteur Algérie*, x, no. 4, pp. 471–477, 8 refs. Algiers, 1932.

In the mountains of the Tell region of Algeria, the larvae of *Anopheles claviger*, Mg. (*bifurcatus*, Mg. et auct.) breed abundantly in the streams between waterfalls, under overhanging rocks in shady pools with no vegetation, in association with those of *A. marteri*, Sen. & Prun. In the course of observations on *A. maculipennis*, Mg., the author reared an adult of *A. sacharovi*, Favr (*elutus*, Edw.), thus confirming the presence of this species in Algeria [*cf. R.A.E.*, B, xvi, 190]. Further descriptive notes are given on the adult and larva of *A. marteri*. In 1932, the first larvae of this species were taken on 30th April and the last on 22nd June [*cf.* xvi, 189]. Adults that emerged in the laboratory on 8th and 9th May fed on sweetened water but could not be induced to feed on man until the end of May and the beginning of June, when all the males were dead; no eggs were deposited. *A. marteri* appears to be closely allied to *A. lindesayi*, Giles, and its varieties [xix, 206].

Senevet (G.). **A propos d'*Anopheles coustani* Laveran.**—*Arch. Inst. Pasteur Algérie*, x, no. 4, pp. 478–484, 7 refs. Algiers, 1932.

From an examination of specimens previously identified by comparison with the type as *Anopheles coustani*, Laveran, the author concludes that this species is identical with *A. mauritianus*, Grp., and as he has ascertained definitely that the description of the latter was published on 19th June 1901 and of the former on 3rd February 1900, the name *mauritianus* becomes a synonym. Edwards' descriptions of the adults of *A. coustani* (*mauritianus*) and its varieties, var. *paludis*, Theo., var. *ziemanni*, Grünb., and var. *tenebrosus*, Dön. [*R.A.E.*, B, xvi, 93], are quoted, and notes are given on their distribution and on the morphology of the pupae of the typical form and of var. *paludis*. The author has no record of var. *ziemanni* from Jinja, Uganda, and considers that the pupae from that locality previously regarded as a variety [xxi, 17] probably belong to the typical form.

Cours de Paludologie—1932.—*Arch. Inst. Pasteur Algérie*, x, no. 4, pp. 485–601, text ill. Algiers, 1932.

A course of malariology given by various workers in Algeria in 1932 is outlined, with summaries of the lectures, notes on the ground covered during tours of demonstration and brief accounts of the results obtained on tours of practical application.

Buxton (P. A.). **The Effect of climatic Conditions upon Populations of Insects.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 4, pp. 325–356, 5 diag., 63 refs. London, 31st January 1933.

The author discusses in detail, both from the literature and from his own observations, the effect of climatic factors, particularly temperature and humidity, on the development and reproduction of insects, with special reference to those of medical importance. He considers that in studying this problem, observations in the field are a necessary preliminary to more detailed work in the laboratory, where experiments can be devised in which only single factors vary and precise and repeatable results can therefore be obtained. The ultimate object of such investigations is the understanding of the laws of physiology and physics that will permit the interpretation of field observations ; the interpretation, which is synthetic, must be based on work that is essentially analytical.

Anderson (D.). *Anopheles mauritianus* **as a House Haunter.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 4, p. 408. London, 31st January 1933.

The author records the finding of 9 females of *Anopheles coustani* (*mauritianus*) var. *ziemanni*, Grünb., and 32 of var. *tenebrosus*, Dön., under shelves on the verandah of a house in Nigeria in which ordinary collections every other day for the previous five months had revealed only *A. gambiae*, Giles (*costalis*, Theo.), *A. nili*, Theo., and *A. marshalli*, Theo. Some of the individuals were alive, others were in advanced stages of decay, indicating that these places had been used for some time. In routine house catches for the same period only 6 individuals of *A. coustani* var. *tenebrosus* and 1 of var. *paludis*, Theo., had been taken.

Paris Eguílaz (H.). **Contribución al estudio de la epidemiologiá de la enfermedad del sueño en los territorios españoles del Golfo de Guinea.** [A Contribution to the Study of the Epidemiology of Sleeping Sickness in the Spanish Possessions in the Gulf of Guinea.] Demy 8vo, 167 pp., 7 maps. Madrid, 1932. Price, *Ptas.* 6. (With Chapter Summaries in French.)

The author gives an historical account of sleeping sickness in Fernando Po and Spanish Guinea, where it was recognised in 1908 and 1909 respectively, and then describes the position as found there in 1927 and as it obtains at present. Only a few notes on the vector, *Glossina palpalis*, R.-D., are given. Both the fly and the disease have been gradually spreading of recent years and are now to be found everywhere on the island and the mainland.

Hissette (J.). **Mémoire sur l'*Onchocerca volvulus* "Leuckart" et ses manifestations oculaires au Congo Belge.**—*Ann. Soc. belge Méd. trop.*, xii, no. 4, pp. 433–529, 29 figs., 6 pp. refs. Brussels, 30th December 1932.

A detailed account is given of observations on *Onchocerca volvulus* in the Belgian Congo, where the author has found developmental stages in the Simuliids, *Simulium* (*Eusimulium*) *damnosum*, Theo., and *S.* (*E.*) *neavei*, Roub. [*cf. R.A.E.*, B, x, 16]. The Simuliids are most numerous in cultivated fields in wooded valleys and are only found in villages on the crests of ravines if the forest is in close proximity. They were not observed on grassy plateaux at a distance from ravines, and in these localities infestation of man by *Onchocerca* is more rare. Regions where Simuliids are found are characterised by deep ravines with clear streams, separated by hills with narrow crests and forest vegetation reaching to their summits. The most favourable conditions for infection are found in villages on the crests where the large number of trees retained provide shade for the flies. The author describes numerous cases in which pathological conditions were found to be due to the presence of microfilariae of *O. volvulus* in the different tissues of the eye [*cf.* xiv, 62]. Such conditions are the most serious of the complications due to infestation, since they lead slowly but surely to blindness. *O. volvulus* and *O. caecutiens* [vii, 160], which are morphologically indistinguishable, are separated chiefly on clinical and biological grounds, but the author points out that the location of the nodules on the head, which is characteristic of *O. caecutiens*, is more frequent in Africa than has hitherto been recognised [*cf.* xiii, 97], and that ocular complications in certain regions reach high proportions.

Schwetz (J.). **Notes géographiques d'entomologie médicale sur la Province Orientale (Congo Belge). (Tiques, Tabanides et "Maringoins.")**—*Ann. Soc. belge Méd. trop.*, xii, no. 4, pp. 549–555, 6 refs. Brussels, 30th December 1932.

Lists are given of the ticks with their hosts and of the Tabanids occurring in the Eastern Province of the Belgian Congo, showing the localities in which they were collected. In addition to the species of *Culicoides* and *Simulium* already noticed [*R.A.E.*, B, xix, 82], the author records *C. pallidipennis*, C., I. & M., *C. fulvithorax*, Aust., which is rare, and *S. neavei*, Roub., which was found in some numbers

in a locality where numerous cases of infestation of man by *Onchocerca volvulus* occurred and may be concerned in the transmission of this parasite [see preceding paper].

Van Slype (W.). **Trois cas de myiase intestinale à** *Apiochaeta scalaris*.—*Ann. Soc. belge Méd. trop.*, xii, no. 4, pp. 581–582. Brussels, 30th December 1932.

Eggs of the Phorid, *Megaselia* (*Aphiochaeta*) *scalaris*, Lw., were found in the stools of 3 natives in the Belgian Congo. The eggs hatched 5 days after being placed on agar-agar, the larvae pupated in 4 days and the adults emerged 14 days later. The females deposit eggs in excrement, in decomposing vegetable matter and accidentally on food. From the small number of cases observed and from the fact that the eggs were found several times, it would appear that they were ingested on contaminated food.

Russell (P. F.) & West (A. P.). **The Effect on** *Culex* **Larvae of Paris Green diluted with Charcoal and Notes on the Feeding Habits of** *Culex quinquefasciatus*. **Larvicide Studies, V.**—*Philipp. J. Sci.*, xlix, no. 4, pp. 651–675, 3 pls., 1 fig., 7 refs. Manila, December 1932.

The authors discuss experiments undertaken in the Philippines to test the effect on larvae of *Culex fatigans*, Wied. (*quinquefasciatus*, Say) of Paris green, either partially absorbed by charcoal (1 : 99) as used against Anopheline larvae [*R.A.E.*, B, xx, 236] or mixed with other diluents. The detailed results are shown in tables. Observations were also made on the feeding habits of the larvae of this mosquito, and they were found to feed at the surface, just below the surface in the position usually described, and at the bottom ; in deep containers few were found at the bottom, but a certain number were observed about 6 ins. from the surface, where they appeared to be exploring and not feeding. They do not feed constantly in one position. The Paris green and charcoal dust was distinctly toxic to the larvae both in the laboratory and in the open, but the results were not so good as those with Anophelines, and were obtained much more slowly owing to the feeding habits of the Culicine larvae. Paris green and sand was almost as effective, but mixtures with lime and with rice-stalk ashes were much less so. The charcoal floats indefinitely, supporting the Paris green so that the larvae have time to obtain a lethal dose. The film of charcoal appears to act as a deterrent to oviposition and also persists sufficiently long to be available to larvae hatching after its application, or to those previously too young to ingest the particles.

Kingsbury (A. N.). **Annual Report of the Institute for Medical Research for the Year 1931.**—*Ann. Rep. Med. Dept. F.M.S. 1931*, pp. 86–211. Also separately published, 126 pp. Kuala Lumpur, 1932.

Much of the information of entomological interest in this report has already been noticed from other sources [*R.A.E.*, B, xx, 168, 199, 276].

In dissections at intervals of mosquitos infected with *Plasmodium falciparum*, sporozoites in the salivary glands were first observed in *Anopheles kochi*, Dön., *A. maculatus*, Theo., *A. vagus*, Dön., and *A. philippinensis*, Ludl., on the 11th, 12th, 14th and 15th days respectively,

and these results are believed to furnish a reasonable indication of the time of development of this parasite under natural conditions. Sporozoites of *P. inui* [from *Macacus cynomolgus*] and *P. vivax* were found in *A. kochi* on the 16th day and in *A. maculatus* on the 17th and 16th days respectively, but the observations with them were not sufficiently numerous to afford reliable evidence of the normal time of development. Although 22 batches each consisting of 10 individuals of *A. maculatus* and 3 batches each of 10 individuals of *A. kochi* were fed on cases having gametocytes of *P. malariae* in the blood, none of the mosquitos dissected after 16 days showed sporozoites in the salivary glands. Other attempts using *A. philippinensis* and *A. vagus* were also negative. In experiments to determine whether the danger of malaria transmission by Anopheline mosquitos is dependent on their inherent susceptibility to infection or whether they are all susceptible and it is connected with their numbers and feeding habits, it was found that *A. kochi*, which appears to be harmless locally, was more susceptible to infection with *P. falciparum*, *P. vivax* and *P. inui* than *A. maculatus*, *A. vagus* or *A. philippinensis*. A large series of experiments was undertaken to test the relative avidity for blood of various species of Anophelines, which were given equal opportunites to feed on human gametocyte carriers or on a monkey (*Macacus cynomolgus*). The results are shown in tables. *A. maculatus*, which is an important vector of malaria in the hills, showed the greatest avidity for the blood of both man and monkeys. A few females of *A. asiaticus*, Leic., and *A. watsoni*, Leic., were applied to man, but regularly refused to take blood. *A. kochi*, *A. philippinensis*, *A. vagus* and *A. aconitus*, Dön., have been infected with *P. falciparum* (the last-named in the mid-gut only), *A. hyrcanus* var. *sinensis*, Wied., and *A. subpictus* var. *malayensis*, Hack., with *P. vivax*, and *A. kochi*, *A. maculatus* and *A. vagus* (mid-gut only) with *P. inui*.

JACKSON (R. B.). **A brief Account of Mosquitoes. Their Life History, and the Diseases which they carry, with Special Reference to Hong Kong.**—*Hong Kong Nat.*, iii, no. 3–4, pp. 207–215, 5 figs. Hong Kong, December 1932.

A short general account is given of the life-history of mosquitos and of the antomy of the larvae and adults. The Anophelines most common in Hong Kong are *Anopheles maculatus*, Theo., *A. minimus*, Theo., and *A. hyrcanus*, Pall.

HAUB (J. G.) & MILLER (D. F.). **Food Requirements of Blowfly Cultures used in the Treatment of Osteomyelitis.**—*J. Exp. Zool.*, lxiv, no. 1, pp. 51–56, 1 fig., 7 refs. Philadelphia, Pa., 5th November 1932.

The authors carried out a series of experiments in Ohio in the breeding of *Lucilia sericata*, Mg., and *Phormia regina*, Mg., for the treatment of osteomyelitis, with a view to eliminating as much of the routine as possible [*cf. R.A.E.*, B, xx, 126, etc.]. For rearing larvae, lean beef was found to be the most satisfactory of 8 different foods tested, while for adult flies lump sugar, lean beef and fresh water provided the best diet. The average period of oviposition on this diet was 30 days, the eggs being collected three times a week. The diet was found efficient after use for 10 months, covering 10 generations.

MICHELBACHER (A. E.), HOSKINS (W. M.) & HERMS (W. B.). **The Nutrition of Flesh Fly Larvae,** *Lucilia sericata* **(Meig.). i. The Adequacy of sterile synthetic Diets.**—*J. Exp. Zool.*, lxiv, no. 1, pp. 109–132, 1 pl., 1 fig., 31 refs. Philadelphia, Pa., 5th November 1932.

The following is the authors' summary : A method of sterilising the eggs and the larval food of *Lucilia sericata*, Mg., has been developed and used in a study of the nutritional needs of the larvae. It was first proved that normal development to the adult stage is possible on fish and concentrated fish extracts in the absence of micro-organisms. On a considerable number of foods, such as the common bacteriological media, yeast, hen's egg and several other foods, growth was impossible or slow and emergence did not occur. Technical casein with agar solution to prevent drying allowed good growth. Highly purified casein was a very deficient food, but addition of yeast, mineral salts and butter or cod-liver oil gave good results except for irregularity in shape of the pupae. Addition of a small amount of cystine resulted in perfect pupae and as rapid growth and as high pupation and emergence as occur on natural contaminated flesh. The liquefying action of bacteria on solid foods is often useful to the larvae. On foods that do not allow fairly rapid growth of the larvae, bacteria are often harmful, and on very poor foods they invariably are. The advantages of insects as test animals in nutritional work are pointed out.

BISHOPP (F. C.). **Mosquitoes kill Live Stock.**—*Science*, lxxvii, no. 1987, pp. 115–116. New York, 27th January 1933.

A recent outbreak of *Psorophora columbiae*, Dyar & Knab, which lasted several days and resulted in the death of domestic animals and poultry, is recorded from Florida. It began suddenly on the night of 5th September, and many animals were dead or dying the next morning. An investigation into losses reported from the vicinity of Miami verified reports of the loss of 80 cattle, 67 pigs, 3 horses, 1 mule, 20 fowls and 2 dogs. The milk supply from one district was greatly reduced between 6th and 10th September and had not returned to normal 10 days later. Though the death of the animals was attributed to loss of blood, in the author's opinion death may have also been due to injection of a toxin by this mosquito.

The eggs of *P. columbiae* are laid on the soil and hatch quickly when submerged by floods, great swarms of adults emerging almost simultaneously. They are usually of little importance as pests of man, but in this outbreak men looking after stock were obliged to wear heavy coats and blankets for protection.

HALL (D. G.), HULL (J. B.) & DOVE (W. E.). **New Method in Sand Fly Studies (Diptera : Chironomidae).**—*Ent. News*, xliv, no. 2, pp. 29–32, 2 figs., 1 ref. Philadelphia, Pa., February 1933.

A description is given of a light trap used successfully to trap Ceratopogonids in marshy areas. It consists essentially of a metal cylinder, which is attached in place of the rim and lens of the headlight on an ordinary small car and inside which is suspended horizontally a pint-size glass jar, with a celluloid cone extending from the rim of the cylinder into the mouth of the jar. The other lights of the car are cut

off while the trap is in use. Large insects may be kept out by a coarse wire screen, and the effects of coloured lights can be studied if gelatin filters are mounted between clear lenses and placed at the rear rim of the trap.

For preserving specimens of *Culicoides*, *Leptoconops*, etc., the authors recommend a solution of 85 cc. ethyl alcohol (95 per cent.), 15 cc. formalin (10 per cent.) and 5 cc. glycerine, which also serves as a treatment preparatory to mounting. Specimens may be left in it indefinitely, but not for less than 24 hours. Hetherington's solution for Nematodes has been found effective for fixing, clearing and dehydrating Dipterous larvae and non-pigmented insects.

Earle (W. C.). **Some Observations of antimosquito Screening and screening Materials.**—*Puerto Rico J. Publ. Hlth. Trop. Med.*, viii, no. 2, pp. 227–234. San Juan, P.R., December 1932. (With a translation into Spanish pp. 235–242.)

Investigations into the problem of screening against Anophelines in Porto Rico has shown that the least obstruction to the movement of the air is caused by a 12-mesh wire screen of ·01-in. wire, the most by cotton cloth. The author considers that in Porto Rico a 12-mesh screen of ·015-in. wire will prove effective against all insects for which screening is used, and owing to the disintegrating effect of the severe atmospheric conditions on the coast, this thickness of wire is advised. From tests on the lasting quality of various materials it is concluded that a bronze screen would probably prove most satisfactory for ordinary use, but Monel metal, which is much more expensive, may be used for special work, and galvanised wire, which is considerably cheaper, may be employed away from the coast or where conditions are not so severe.

Bacigalupo (J.). *Ceratophyllus fasciatus*, **Bosc, espontaneamente infectado con Cercocistis** *Hymenolepis fraterna*, **Bacigalupo.** [*C. fasciatus* naturally infected with *H. fraterna*.]—*Rev. chil. Hist. nat.*, xxxvi, pp. 144–147, 2 figs. Santiago de Chile, 1932.

The author records the finding of cysticercoids in an example of *Ceratophyllus fasciatus*, Bosc, taken on a rat found to be infected with *Hymenolepis fraterna*. This natural infection confirms experimental results [*R.A.E.*, B, xix, 222] and shows this flea to be an intermediate host of the Cestode.

Anigstein (L.). **Malaria and Anophelines in Siam. Report on a Study Tour.**—*Quart. Bull. Hlth. Org. League Nat.*, i, no. 2, pp. 233–308, 18 figs., 1 map, 17 refs. Geneva, June 1932.

In this report an outline is given of the conditions in certain areas of Siam where malaria is of most importance. The investigations were carried out from the middle of January to the end of April 1931. The topography, climate, population, crops, irrigation, etc., of the country in general are discussed.

Investigations of the deltaic region, which forms the southern part of the central plain and is one of the richest rice-growing areas in the world, were chiefly concentrated on conditions in and around Bankok. This region is irrigated by a vast system of channels connected with the river, and these are rendered unfavourable to mosquito breeding by periodical changes of water level owing to the tide, by the suspension of silt in the water and by the scarcity or absence of aquatic vegetation. In plantations of fruit trees and in gardens, it was found that so long as the final irrigation ditches were in permanent communication with the larger channels and were therefore influenced by the tide, no mosquito breeding took place ; but those parts that were partly or completely disconnected and contained shallow, stagnant, clear water with an abundance of aquatic vegetation formed ideal breeding-places for Anophelines, which were also found in the channels and ditches of almost stagnant water along the roadsides and in the pools and ponds present in the compounds of houses. Although seven species of *Anopheles* were collected, only two, *A. annularis*, Wulp (*fuliginosus*, Giles) and *A. aconitus*, Dön., are known to be malaria carriers of importance, and these are not very common in Bankok. The incidence of malaria appears to be low, but owing to the abundance of Culicines as well as Anophelines, mosquitos constitute a nuisance. It is recommended that the water in the whole system of irrigation channels should be kept in permanent circulation, and that if road ditches are not in communication with the channels, they should be periodically dredged, their edges cleared and the aquatic vegetation removed. The excavation of borrow pits should be prohibited, and a piped water supply should be introduced so that domestic water receptacles in which Culicines breed may be abolished.

Malaria is endemic in the great majority of the rural areas and hyperendemic in certain districts of each of the provinces visited in the north of Siam. With the exception of one city, where malaria is endemic, the other provincial centres are only slightly affected. The disease is most prevalent in the foothill zones, where the dangerous vectors, *A. fluviatilis*, James (*listoni*, List.), *A. culicifacies*, Giles, *A. minimus*, Theo., and *A. maculatus*, Theo., were found breeding at the grassy edges of the rivers and in the shallow, clear, sandy hill streams utilised for irrigation purposes. The frequent association of hyperendemic malaria with the presence of the first three species indicates that they are the important vectors. *A. maculatus* was found only twice and appears to be rare. *A. fluviatilis* and *A. culicifacies* were also found in irrigation channels of rice-fields, but only when these formed short branches of clear streams. The scanty production of rice, owing to poor soil and insufficient water supply, is the main cause of the poverty of the rural population in the northern plains, and this factor, together with lack of medical attention, has produced a serious malaria problem. The low incidence of malaria in the cultivated, artificially irrigated, level stretches at some considerable distance from hill streams indicates that if the scheme that has been suggested for the artificial irrigation of the plains were carried out, the living conditions would remain healthy. Owing to the alluvial character of the soil, the originally clear streams, after flowing as irrigation channels for a long distance, would become full of silt and therefore unfavourable for the breeding of malaria-carrying Anophelines.

A survey of a small area at the foot of the hills to the north-east of Bankok showed conditions to be the same as in the cultivated,

naturally irrigated areas of the northern foothills, and both *A. fluviatilis* and *A. culicifacies* were found breeding in the two clear, swift-running streams, especially at the grassy edges. Only in this area are anti-larval measures considered economically practicable. It is recommended that the two streams should be joined and transformed into a concrete subsoil drain, and that streams flowing through the cultivated areas should be oiled from the time the rains cease to flush out the larvae until the water dries up.

Investigations in three eastern provinces in southern Siam showed that in the coastal zone, where malaria is associated with *A. sundaicus*, Rdnw. (*ludlowi*, auct.), its incidence is moderate, probably owing to the restricting influence of the daily tides on the breeding of this Anopheline. The cultivated areas further inland, which are irrigated by streams, may be malarious, the disease being associated chiefly with *A. aconitus*, and rarely with *A. culicifacies*. In the central hilly region, severe hyperendemic malaria is associated, as in the north, with the breeding of *A. fluviatilis* and *A. minimus* in streams. In general, however, the incidence of malaria in the south is much lower than in the north.

Such measures as subsoil drainage, oiling and screening are considered economically impracticable as anti-malaria measures under Siamese conditions, but the use of mosquito nets is advised, and the importance of organising a system of quinine distribution is discussed. In one area, a home-made cloth is employed with success in place of netting, and propaganda to extend its use are suggested.

BISHOPP (F. C.), CORY (E. N.) & STONE (A.). **Preliminary Results of a Mosquito Survey in the Chesapeake Bay Section.**—*Proc. Ent. Soc. Wash.*, xxxv, no. 1, pp. 1–6. Washington, D.C., January 1933.

A brief account is given of preliminary mosquito surveys carried out in the Chesapeake Bay areas of Maryland and Virginia. The data were chiefly obtained from light traps of the New Jersey type [*R.A.E.*, B, xx, 241] operated more or less continuously from the end of June or early July until about 1st October, most of them being emptied daily. A certain amount of hand-collecting of both adults and larvae was also carried out. A table is given showing the 28 species of mosquitos taken, the localities where they were collected, and their relative abundance in each locality throughout the season. Brief notes are also given on some of them. *Anopheles atropos*, D. & K., a species that has hitherto been reported only from the extreme southern States, was taken at two localities in Maryland and one in Virginia. *A. crucians*, Wied., was the most widely distributed of the Anophelines, being taken in traps in 15 out of 18 localities; it was present throughout the trapping period but was apparently slightly more abundant in July. *A. quadrimaculatus*, Say, the principal vector of malaria in this region, was taken in traps in 14 localities and was present throughout the season, being slightly more numerous during the first week in July and the first week in August. *A. punctipennis*, Say, was present throughout the trapping period, but in no case were many individuals taken. A knowledge of the prevalence of *A. quadrimaculatus* and *A. punctipennis* in certain localities where the traps were operated indicates that these species do not enter the traps in proportion to their relative abundance. *A. walkeri*, Theo., was relatively rare.

O'Roke (E. C.). **The Incidence, Pathogenicity and Transmission of** *Leucocytozoon anatis* **of Ducks. (Abstract.)**—*J. Parasit.*, xvii, no. 2, p. 112. Urbana, Ill., 1930.

O'Roke (E. C.). **The Life History of** *Leucocytozoon anatis* **Wickware. (Abstract.)**—*J. Parasit.*, xviii, no. 2, p. 127. Urbana, Ill., 1931.

Twinn (C. R.). **The Blackfly,** *Simulium venustum* **Say, and a Protozoon Disease of Ducks.**—*Canad. Ent.*, lxv, no. 1, pp. 1–3, 6 refs. Orillia, January 1933.

The first of these papers deals with experiments carried out in the spring and summer of 1930 in Michigan, in which 170 domestic and wild ducks were used for the purpose of studying the disease caused by the protozoon parasite, *Leucocytozoon anatis*. All ducks exposed to infection by biting insects in general or by *Simulium* alone became infected, whereas those that were protected from insects did not. Since *Simulium venustum*, Say, was the only insect observed to bite the ducks, *L. anatis* is evidently transmitted by it. Parasites appeared in the blood of ducks 12 days after they had been exposed to the bites of the flies, and oökinetes were found in the latter after they had fed on the ducks. The disease is apparently not harmful to adult birds, but is pathogenic to ducklings, the mortality being 35 per cent. in the cases studied. As many as 75 fully engorged flies were sometimes removed from a single duckling at a time.

In the second paper the development of *L. anatis* is described. Gametocytes, which are present in the red blood cells of infected birds, are ingested by the females of *S. venustum*, and gametogenesis, fertilisation and oökinete formation take place in the stomach of the flies. Merozoites develop in schizonts in the lungs, liver, spleen and kidneys of ducks that have been bitten by infected flies, and the earliest gametocytes are to be found in the blood cells on the seventh day following infection, mature ones being present on the tenth day. The infected bird usually dies on the twelfth day, unless recovery occurs. Observations indicate that the sexual cycle of the parasite in the fly may be completed in as short a time as five days.

The third paper contains notes on the biology of *S. venustum*, with records of its distribution in Canada, where it is one of the most widespread and troublesome Simuliids. Infection of ducks by *L. anatis* is also common in the Dominion, particularly in the northern districts. *S. venustum* breeds in swift streams, and even in drainage ditches, the larvae and pupae being particularly abundant in spring and early summer in rapids and broken water, being attached to rocks, stones, aquatic plants, débris, etc. The adults are on the wing from May to October and are especially numerous in June and early July. There are probably three or four overlapping generations a year. Observations in Ottawa indicate that hibernation takes place in the larval stage, the larvae being protected against the extremes of cold by the ice and snow that cover the flowing water. *S. venustum* var. *jenningsi*, Malloch, was bred in numbers from aquatic grasses and partly submerged sweet gale in the Ottawa river.

It is suggested that the Simuliid recorded as causing the death of goslings [*R.A.E.*, B, xv, 192] and identified as *S. aureum bracteatum*, Coq., may have been *S. venustum*, since ten females in the National Collection at Fredericton labelled as *bracteatum* proved on examination to be the latter species.

Steward (J. S.). **A Note on *Simulium* sp. attacking Horses and Cattle in Herefordshire.**—*Rep. Inst. Anim. Path. Univ. Cambridge,* ii (1931), pp. 194–197, 14 refs. Cambridge [1932].

In April 1931 horses and calves on a farm in Herefordshire were attacked by *Simulium latipes*, Mg., and *S. ornatum*, Mg. The flies, all of which were females, congregated round the heads of the animals, especially the ears. The breeding-place was discovered ¾ mile away in a swiftly running stream with an alternately muddy and stony bottom, the larvae and pupae being attached to the lower surface of some of the stones in the swiftest parts of the stream. Brief descriptions of the adults, larvae and cocoons of Simuliids are given. The female lays up to 500 eggs, which are attached to stones or vegetable matter in the swiftest parts of the stream ; pupation takes place in a cocoon attached to the under surface of a stone or to the leaf of a water plant. The hibernating stage has not been ascertained, but larvae of *S. ornatum* of varying sizes have been found by the author in the winter months. Larvae and pupae of *S. ornatum* were also collected in May in Devonshire (Dartmoor), but the pupae and the resulting adults were only half the size of those from Herefordshire, possibly because the flies had a less abundant food-supply, as cattle and sheep were scarce. It is suggested that the observed fact that the flies of the early broods are larger may be explained, at least in the case of *S. ornatum*, by the possible hibernation of this species in the larval stage, so that more food is taken during the long larval period.

Some of the literature on the veterinary importance and control of Simuliids is briefly reviewed.

Kinoshita (S.) & Yajima (T.). **On three Species of Tabanidae attacking Horses and Cattle.** [*In Japanese.*]—*Rep. Imp. Vet. Expt. Sta.*, no. 14, pp. 471–484, 4 pls. Chiba, October 1932.

Descriptions are given of all stages of *Chrysops basalis*, Shiraki, *Tabanus cordiger*, Mg., and *T. miyajima*, Ric., with very brief notes on the periods during which they emerge in Japan.

Kalandadse (L.). **Materialien zum Studium der Atmungsprozesse der Mückenlarven und -puppen und der Einwirkung von Petroleum, Beschattung un Verunreinigung des Wassers auf dieselben.** [Studies of the Respiration Processes in Mosquito Larvae and Pupae and of the Effect of Kerosene, Shade and Pollution of Water.]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 2, pp. 88–103, 1 fig., 14 refs. Leipzig, 1933.

The experiments described were made at Batum (Georgia) during the summer of 1930, the temperature in the insectarium being never below 22°C. [71·6°F.]. To test the effect of the exclusion of atmospheric air, mosquito larvae and pupae were placed in glass jars filled with water and sealed hermetically without air-bubbles. In all cases the pupae succumbed before the larvae. Pupae of *Anopheles maculipennis*, Mg., began to die in an hour and all perished in 8 hours. Those of *Culex* and *Aëdes* (*Stegomyia*) gave about the same result, the first deaths occurring in 2 hours, and the last in 20–22. Last instar larvae of *Anopheles* began to die after 7 hours, and they all soon perished, but only a few young larvae were dead after 10 hours, most of them living for about 20. Full-grown *Culex* larvae began to die after 7·8 hours and all perished in 20 hours, when only a few young larvae had died.

Full-gown *Aëdes* larvae began to die after 7 hours, and all were dead in 22; the young larvae began to die after 22 hours. It is evident that larvae and pupae can survive without atmospheric air for longer than had generally been supposed. In experiments to ascertain if temporary deprivation of atmospheric air has subsequent injurious effects, larvae of *Anopheles* kept for 3–4 hours from atmospheric air subsequently developed normally. Pupae were more sensitive, but in most cases they transformed into adults after deprivation for 1 hour.

Very little air is required by larvae and pupae; in jars in which algae produced small air-bubbles, mature *Anopheles* larvae lived for 3½ days, and young ones for 7 days (when the experiment was interrupted). Mature *Culex* larvae lived for 4 days, and young ones for more than 20. In the case of *Aëdes* larvae an even more remarkable result was obtained; one mature larva lived for 2 days attached to an air-bubble, pupated, and after 3 days the adult emerged and lived for 3 days inside the bubble. This raises the question of the value of duckweed (*Lemna*) in controlling mosquito larvae by forming a mat over the surface of water. It is probable that the air-bubbles on this plant would always permit the emergence of some of the adults. The capacity of adults and larvae to live without atmospheric air explains why continuous heavy rain fails to kill them. The author considers that the anal or tracheal gills of the larvae and pupae permit breathing under abnormal conditions [*cf.* *R.A.E.*, B, xxi, 74]. They are larger in *Aëdes* than in *Anopheles*.

From various oiling experiments it is concluded that the oil penetrates into the tracheae and shuts off the body-fluid from the air in them, and furthermore acts as a contact poison. Larvae and pupae at the oiled water surface died before those at the bottom. In all cases the pupae died before the larvae and the younger larvae before the older ones.

It has been stated that larvae of *A. maculipennis* are absent from water that is entirely shaded [*R.A.E.*, B, xix, 191], but in strictly comparative tests eggs and larvae of this mosquito developed in the same way in complete darkness as in normal light. Many workers have found that the larvae of *A. maculipennis* are very sensitive to pollution of water by organic matter, but the results of experiments with dung were not altogether conclusive, and in practice if dung were added to water for control very large quantities would be needed and favourable conditions would be created for *Culex* by the pollution.

GABRIEL (J.). **Le paludisme et l'anophélisme en Russie Subcarpathique.**—*Trav. Inst. Hyg. publ. Tchécoslov.*, iii, no. 2, pp. 23–31, 1 pl., 1 chart, 10 refs. Prague, April 1932.

Anophelines are more or less prevalent throughout Czechoslovakia, but malaria only occurs in the provinces of Slovakia and Carpathian Ruthenia, and in the latter area is almost confined to the southern districts. *Anopheles maculipennis*, Mg., is the most widely distributed Anopheline, other species being *A. sacharovi*, Favr, and *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.), which was extremely rare. The presence or absence of malaria in different parts of Holland has been associated with the existence of distinct races of *A. maculipennis* [*R.A.E.*, B, xv, 21, 145, etc.], and as malaria conditions are similar in Carpathian Ruthenia, it is possible that similar races are involved. This suggestion was largely confirmed by an examination and measurement of about 200 females of this species collected in the second half of October 1928. Two races were found similar to those already characterised [*cf.*

also xv, 180; xvi, 242; xvii, 178], one being small and usually dark coloured, and the other large and usually light. Most of the mosquitos were of the latter type, having long wings and body and a smaller number of maxillary teeth. Of the females of the large type, only 3·3 per cent. were engorged, as compared with 62·1 of those of the small type. The fat-body was well developed in 86·5 per cent. of the large mosquitos and 28·8 per cent. of the small ones, the latter figure being higher than the corresponding one recorded in Holland [xv, 146]. The high percentage of mosquitos with a well-developed fat-body indicates that in Carpathian Ruthenia the Anopheline fauna consists chiefly of the hibernating race, which is less active and consequently of less importance in the epidemiology of malaria than the small non-hibernating one [xv, 146].

de Buen (E.), Gil Collado (J.) & Astudillo (J. N.). **El *Anopheles maculipennis* Meig. en sus cobijos de pleno campo. (Nota preliminar.)** [*A. maculipennis* in its Shelters in the Field. Preliminary Note.]—*Med. Países cálidos*, vi, no. 1, pp. 1–4. Madrid, January 1933.

In order to obtain information regarding *Anopheles maculipennis*, Mg., adults were captured in traps placed over holes in oaks, the commonest trees in the zone of Navalmoral de la Mata, Spain. The mosquitos either entered the traps when leaving the holes at sunset or were driven from the latter by smoke produced by burning very dry cow-dung. From July to October 1932, 36 males and 38 females were taken with smoke, and 174 males and 114 females without smoke. The majority occurred in oaks far from inhabited places, only 6 males and 8 females being captured in those near dwellings, barns, huts, and sheep-folds. The trees were therefore disregarded where dwellings were available. None of the 152 females contained blood, and in 148 the fat-body was absent or little developed. Eggs ready for deposition were found in 4 females, less mature fertilised eggs in 44, and unfertilised eggs in 104. It is concluded that tree-holes are merely temporary shelters for mosquitos migrating to or from their breeding-places.

Papers noticed by Title only.

Tonkes (P. R.). **Recherches sur les poils urticants des chenilles.**—*Bull. biol. Fr. Belg.*, lxvii, no. 1, pp. 44–99, 2 pls., 3 pp. refs. Paris, 1933.

Krijgsman (B. J.) & Ponto (S. A. S.). **De teken van den Oost-Indischen Archipel.** [The Ticks of the Netherlands Indies Archipelago.]—*Veeartsenijk. Meded.*, no. 79, 62 pp., 48 figs., 5 maps, 27 refs. Batavia, 1932.

Monteiro (J. Lemos) & da Fonseca (F.). **Nouvelles expériences sur la transmission expérimentale du typhus exanthématique de Sao Paulo par des tiques** (*Boophilus* [*annulatus*] *microplus* **et** *Amblyomma cajennense*).—*C. R. Soc. Biol.*, cxii, no. 4, pp. 397–400, 5 refs. Paris, 1933. [See *R.A.E.*, B, xxi, 68.]

Reed (E. P.). **Larvas de Dipteros encontradas en las Fosas Nasales de un Enfermo, en el Hospital Van Buren, de Valparaiso.** [Larvae of *Cochliomyia macellaria*, F., found in the nasal Cavities of a Patient in the Van Buren Hospital in Valparaiso.]—*Rev. chil. Hist. nat.*, xxxvi, pp. 143–144. Santiago de Chile, 1932.

BISHOPP (F. C.) & DOVE (W. E.). **The Horse Bots** [*Gastrophilus* spp.] **and their Control.**—*Fmrs' Bull. U.S. Dept. Agric.*, no. 1503 revd., 14 pp., 8 figs. Washington, D.C., September 1932. [*Cf. R.A.E.*, B, xv, 50 ; xix, 216.]

McCULLOCH (R. N.) & NOBLE (N. S.). **The Cattle Louse** *Solenopotes capillatus* **recorded from New South Wales.**—*Agric. Gaz. N.S.W.*, xliv, pt. 1, p. 10, 4 refs. Sydney, 1st January 1933.

BELLISAI (S.). **Sulla durata di vita della** *Gambusia holbrooki*. [On the Longevity of *G. holbrooki*.]—*Atti Soc. Cultori Sci. med. nat. Cagliari*, no. 5, 1931. (Abstract in *Med. Países cálidos*, vi, no. 1, p. 57. Madrid, January 1933.)

BALDINO (M.). **Ricerche sull'acrescimento somatico di** *Gambusia holbrooki*. [Investigations on the somatic Growth of *G. holbrooki*.]—*R. Com. talasogr. ital.*, clxxiv, Venice, 1930. (Abstract in *Med. Países cálidos*, vi, no. 1, pp. 57–58. Madrid, January 1933.)

BARRAUD (P. J.). *Anopheles aitkeni* **James var. n.** *pinjaurensis* [described from single male in Patiala State].—*Rec. Malaria Surv. India*, iii, no. 2, pp. 353–355, 6 figs. Calcutta, December 1932.

PURI (I. M.). **Studies on Indian Simuliidae. Part VI. Descriptions of Males, Females and Pupae of two new Species** [*Simulium gravelyi* and *S. palniense*] **from Palni Hills and of Male and Pupa of** *S. tenuitarsis* **sp. n. from Bengal Terai.**—*Ind. J. Med. Res.*, xx, no. 3, pp. 803–812, 2 pls., 2 refs. Calcutta, January 1933.

PURI (I. M.). **Studies on Indian Simuliidae. Part VII. Descriptions of Larva, Pupa and Female of** *Simulium nodosum* **sp. nov., with an Appendix dealing with** *S. novolineatum* **nov. nom.** (=*S. lineatum* **Puri**).—*Ind. J. Med. Res.*, xx, no. 3, pp. 813–817, 1 pl., 2 refs. Calcutta, January 1933.

SINTON (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part XXXII.** *Phlebotomus dentatus* **n. sp.** [from Baluchistan].—*Ind. J. Med. Res.*, xx, no. 3, pp. 869–872, 1 pl., 3 refs. Calcutta, January 1933.

SINTON (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part XXXIII.** *Phlebotomus hodgsoni* **n. sp.**—*Ind. J. Med. Res.*, xx, no. 3, pp. 873–878, 2 pls., 3 refs. Calcutta, January 1933.

SINTON (J. A.). **A New African Sandfly**—*Phlebotomus transvaalensis* **n. sp.** [from Transvaal].—*Ind. J. Med. Res.*, xx, no. 3, pp. 879–881, 1 pl. Calcutta, January 1933.

[PERFIL'EV] PERFILJEW (P.). **Ueber neue Stechmücken aus Mittelasien (Turkmenistan).** [New Sandflies from Central Asia (Turkmenistan) (*Phlebotomus pawlowskyi*, *P. squamipleuris*, *P. sumbaricus*, spp. n., and *P. minutus* var. *arpaklensis*, n., all of the *minutus* group).]—*Zool. Anz.*, ci, no. 7–8, pp. 221–227, 11 figs., 12 refs. Leipzig, 15th January 1933.

DA FONSECA (F.). **Differentiation of Flagellates of the Genus** *Leishmania* **Ross, 1903, by the Lytic Action of Specific Sera.**—*Amer. J. Trop. Med.*, xiii, no. 1, pp. 113–126, 55 refs. Baltimore, Md., January 1933.

[PAVLOVSKIĬ (E. N.).] **Павловский (Е. Н.).** *Ornithodorus lahorensis* **und das Verhältniss desselben zur Uebertragung des Zecken-Recurrens.** [*O. lahorensis* and its Relation to the Transmission of Tick-borne Relapsing Fever.] [*In Russian.*]—*Murgabsk. Parazit. Eksped. 1930 Akad. Nauk SSSR i Narkomzdr. Turkm.* [*Murghab Parasit. Exped. 1930 Acad. Sci. USSR & Hlth. Commissar. Turkmen.*], in *Trud. Sov. Izuch. proizvod. Sil*, Ser. Turkmen., pt. 2, pp. 79–100, 2 figs. Leningrad, Acad. Sci., 1932.

In view of the lack of proof that *Ornithodorus lahorensis*, Neum., is a vector of relapsing fever, though this has been suggested [*R.A.E.*, B, viii, 197], transmission experiments with it were carried out in Turkmenistan in the summer of 1930. This tick is widely distributed in Central Asia, but in Turkmenistan has only been found in the town of Ashkhabad, where nymphs were collected on camels that had arrived from Persia. The individuals used in the experiments originated from Persia, eastern Uzbekistan and Armenia. They were fed on guineapigs infected with Central Asiatic relapsing fever (*Spirochaeta sogdiana*) and then on healthy ones, but in no case were the latter infected, though the disease was readily transmitted to them by *O. papillipes*, Bir. When placed on man, *O. lahorensis* did not bite. Only 9 per cent. of the ticks emitted coxal fluid when biting. Injections of emulsions of salivary glands and malpighian tubes of ticks that had fed on infected guineapigs 23 days previously did not produce infection, but positive results were secured with an emulsion of the stomachs.

From these investigations the author concludes that the only proved vector of the tick-borne relapsing fever of Central Asia is *O. papillipes* [xvii, 226 ; xviii, 7 ; xix, 256].

[SIMANIN (P. I.).] **Симанин (П. И.). Ueber die Mückenfauna und Malaria im Murghab'schen Tale.** [On the Mosquito Fauna and Malaria in the Murghab Valley.] [*In Russian.*]—*Murgabsk. parazit. Eksped. 1930 Akad. Nauk SSSR i Narkomzdr. Turkm.* [*Murghab Parasit. Exped. 1930 Acad. Sci. USSR & Hlth. Commissar. Turkmen.*], in *Trud. Sov. Izuch. proizvod. Sil*, Ser. Turkmen., pt. 2, pp. 105–118, 7 figs. Leningrad, Acad. Sci., 1932.

Details are given of investigations on the incidence of malaria and Anophelines in the valley of the river Murghab in Turkmenistan in the summer of 1930. The topography of the country and the types of water in which the larvae breed are discussed, and lists are given of the mosquitos found in individual localities. Favourable breeding-places are afforded by permanent marshes and lakes, streams and accumulations of subsoil water in low-lying places, neglected irrigation ditches covered with dense vegetation, and pools of drainage water from irrigated fields. There was practically no malaria and only a limited mosquito fauna in the southern district of Kushka, probably as a result of the drainage work that is carried out there. *Anopheles superpictus*, Grassi, was the most widely distributed species, being particularly abundant in August-September, when the incidence of the disease is high. Other species in order of their abundance were *A. pulcherrimus*, Theo., which was even more prevalent than *A. superpictus* in some localities, and *A. hyrcanus* var. *pseudopictus*, Grassi, which only occurred in negligible numbers, possibly owing to the abandonment of the cultivation of rice in the region. The disappearance

of rice-fields may also account for the absence of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) and *A. maculipennis*, Mg., which have previously been recorded in this area.

[PERFIL'EV (P. P.).] **Перфильев (П. П.). Beiträge zur** *Phlebotomus*-**Fauna in Turkmenistan.** [On the Sandfly Fauna of Turkmenistan. (*In Russian.*)]—*Murgabsk. parazit. Eksped. 1930 Akad. SSSR i Narkomzdr. Turkm.* [*Murghab Parasit. Exped. 1930 Acad. Sci. USSR & Hlth. Commissar. Turkmen.*], in *Trud. Sov. Izuch. proizvod. Sil*, Ser. Turkmen., pt. 2, pp. 119–141, 13 figs., 28 refs. Leningrad, Acad. Sci., 1932.

Sandflies collected in June-July 1930 from various districts of the Murghab valley and from Ashkhabad (Turkmenistan) included *Phlebotomus papatasii*, Scop., *P. sergenti*, Parr., *P. sergenti* var. *alexandri*, Sinton, *P. caucasicus*, Marz., *P. major*, Ann., *P. chinensis*, Newst., *P. kandelakii*, Shchur., and *P. minutus*, Rond.

In breeding experiments, sandfly larvae that hatched in August and were kept throughout the autumn and winter at a constant temperature of 28°C. [82·4°F.] entered a diapause that varied in duration and pupated without having been subjected to low temperature, the adults emerging in 10–14 days. The females lived in test tubes for from 4 days to 3 weeks and readily fed on man; the males, which were fed on apple juice, lived 8–14 days. No pairing or oviposition was observed. It is pointed out that these observations appear to contradict those of Roubaud and Khodukin [*R.A.E.*, B, xvi, 56; xvii, 236] on the dependence of the asthenic larvae on cold for reactivation and the completion of the life-cycle. Most of the sandflies of the *minutus* group were captured on windows; they only occurred in limited numbers elsewhere. A few individuals of *P. sergenti* were collected in deep holes in mountains at a considerable distance from human dwellings.

The method of preparing sandfly mounts is described, and keys are given to both sexes of the Central Asiatic species of *Phlebotomus*, with descriptions of the distinguishing characters of several of them.

[PETRISHCHEVA (P. A.).] **Петрищева (П. А.). Beiträge zur** *Phlebotomus*-**Biologie des Karakalin'schen Bezirkes der Turkmenischen Sowjetunion.** [Contribution to the Biology of *Phlebotomus* of the Karakala Region of the Turkmen SSR. (*In Russian.*)]—*Murgabsk. parazit. Eksped. 1930 Akad. Nauk SSSR i Narkomzdr. Turkm.* [*Murghab Parasit. Exped. 1930 Acad. Sci. USSR & Hlth. Commissar. Turkmen.*], in *Trud. Sov. Izuch. proizvod. Sil*, Ser. Turkmen., pt. 2, pp. 143–173, 6 figs., 24 refs. Leningrad, Acad. Sci., 1932.

An account is given of observations on the biology of sandflies (*Phlebotomus*) in the Kara-kala region of south-western Turkmenistan carried out from April 1930 to the end of January 1931. They were easily caught on sheets of white paper smeared on both sides with oil or by light traps. In May, June and the first half of July they occurred in limited numbers throughout the whole region, but from mid-July till the end of September they congregated in inhabited places, being abundant in houses, tents and stables that were situated in the vicinity of vegetation or latrines where sufficient moisture was available. A trapping experiment showed that they breed in latrines and make their way from them to the houses.

The seasonal occurrence of the sandflies, which showed two peaks, in July and in September, is discussed. Those observed in and near

human dwellings were *Phlebotomus papatasii*, Scop., *P. sergenti*, Parr., species of the group of *P. minutus*, Rond., *P. caucasicus*, Marz., which was comparatively rare, and species of the group of *P. perniciosus*, Newst., which only occurred in negligible numbers. *P. papatasii* was reared in the laboratory by a method that was a slight modification of one already noticed [*R.A.E.*, B, xiv, 139].

Oviposition usually occurred 4–6 days after feeding, and the number of eggs laid by a female varied from 10 to 70. All the females that had oviposited and died still contained immature eggs, but the cause of this incomplete oviposition was not ascertained ; some of the females were attacked by an unidentified fungus. At 21–26°C. [69·8–78·8°F.] development was completed in 39–53 days.

Details are given of observations on the occurrence of sandflies in the open. Those collected were species already recorded from the Kala-kara region [xix, 27] and *P. major*, Ann., and were found at distances of several miles from the nearest dwelling in caves, ruins, shady gorges, and other places where animals or birds were available for food, though under such conditions they were seldom numerous. They readily attacked man, being attracted by human perspiration, and as soon as a mining settlement or camp was established in an uninhabited locality, they congregated in numbers near the dwellings and even in the galleries in mines. Two mature larvae were found in moderately damp organic matter taken from the nest of a land tortoise, and 19 eggs were obtained from the débris by stirring it in a saturated solution of sodium chloride, in which they floated.

[Popov (V. V.) & Lototzkiĭ (B. V.).] **Попов (В. В.) и Лотоцкий (Б. В.). Die Haustiere und die Invasion derselben durch Ektoparasiten im Murgab'schen Tale.** [Domestic Animals and their Infestation by Ectoparasites in the Murghab Valley.] [*In Russian.*]—*Murgabsk. parazit. Eksped. 1930 Akad. SSSR Nauk i Narkomzdr. Turkm.* [*Murghab Parasit. Exped. 1930 Acad. Sci. USSR & Hlth. Commissar. Turkmen.*], in *Trud. Sov. Izuch. proizvod. Sil*, Ser. Turkmen., pt. 2, pp. 211–233, 6 figs. Leningrad, Acad. Sci., 1932.

Less than a third of this paper, which deals with observations in June-July 1930 in the Murghab valley of Turkmenistan, is devoted to parasites. Many of the domestic animals examined were infested by ticks, chiefly species of *Hyalomma*, though *Rhipicephalus sanguineus*, Latr., occurred in smaller numbers. *Argas persicus*, Oken, and *Dermanyssus gallinae*, DeG., were very abundant on fowls in two localities. Larvae of *Gastrophilus* were extracted from two horses. Warble-flies (*Hypoderma*) were not observed, but they are known to occur on cattle in the area. *Hippobosca equina*, L., and *H. capensis*, Olf., were very common, the former usually occurring on horses and cattle, and the latter on dogs and cats. Larvae of *Wohlfahrtia magnifica*, Schin., were found in a sore on a dog. Notes are also given on the parasites, chiefly ticks, found on wild mammals.

Achundow (I.). **Ueber den heutigen Stand der Malariabekämpfungsfrage in Aserbaidjan.** [On the present Position of the Malaria Control Question in Azerbaijan.]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 3, pp. 136–141, 18 refs. Leipzig, March 1933.

This is a survey of the malaria situation in Azerbaijan and of the organisation of measures against it. To combat the Anophelines that

occur there [*R.A.E.*, B, xx, 58] small breeding-places are to be treated with oil or Paris green, and large ones with Paris green applied from aeroplanes.

GUELMINO (D.). **Ueber den Einfluss der Wärme auf die exogene Biologie der Plasmodien.** [On the Influence of Heat on the exogenous Biology of Plasmodia.]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 3, pp. 141–147. Leipzig, March 1933.

Jugoslavian Macedonia is a very suitable region for investigating the influence of climatic factors on malaria because it can be divided into zones in which the climate is Central European or Mediterranean respectively, with gradual or abrupt transitions between them. Climate does not seem to affect the endogenous development of the malarial *Plasmodium*, but it influences its development in the mosquito, apart from the changes that occur in Anopheline biology in winter. Observations were made in a locality in which transmission of malaria does not occur, although imported cases are present and *Anopheles maculipennis*, Mg., commonly attacks man in dwellings. Day temperatures reach a high level, but night temperatures are very low. Soon after the mosquitos ingest blood, the temperature falls to its daily minimum, and this low temperature apparently prevents exogenous development of the *Plasmodium*. It is therefore assumed that night temperatures are the decisive factor in mosquito infection.

Benign tertian, the commonest form of malaria in Macedonia, occurs from April to the end of October, this long time being possible owing to the adaptation to low temperatures of *P. vivax* at the beginning of its exogenous cycle. According to the author's observations, mosquito infection with *P. vivax* is possible at 18°C. [64·4°F.]; its limit is probably even lower. Malignant tertian is as prevalent as benign tertian in some localities in spite of its shorter season. The epidemic breaks out in July and continues till mid-October. Prior to early June gametocytes of *P. falciparum* are common in man, but new infections do not occur though Anophelines are numerous. It thus appears that the minimum temperature required by *P. falciparum* for beginning its exogenous development is something over 20°C. [68°F.], and this only occurs in July-October. Quartan, which is the rarest form of malaria in Macedonia, is commoner in the cold seasons than in summer. Its practical disappearance in May and reappearance in September, in both of which months the average temperature is 18°C., indicate an upper temperature limit of 18°C. for exogenous development of *P. malariae*. The sequence of infections is broken in late spring by the advent of high temperatures and in autumn by the cessation of mosquito activity. In the hilly districts quartan is more common than in the plains because of lower temperatures, especially at night.

RYBINSKY (S. B.). **Matériaux concernant la faune des moustiques de l'Ukraine du Nord-Ouest. i. Les moustiques du Polessié de l'Ukraine.**—*Bull. Soc. zool. Fr.*, lviii, no. 1, pp. 18–29, 48 refs. Paris, 31st March 1933.

This annotated list of 37 species of mosquitos collected by the author in 1925–31 in north-western Ukraine includes three Anophelines, *viz.*, *Anopheles maculipennis*, Mg., *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) and *A. plumbeus*, Steph.

ROUMIANTZEFF (P. D.). **Matériaux pour la connaisance de la biologie d'*Allothrombium fuliginosum*.** [*In Russian.*]—*Zool. Zh.*, xi, no. 3–4, pp. 73–89, 17 figs., 12 refs. Moscow, 1932. [With a Summary in French.]

An account is given of the results of observations during 1925–26 in Russia on *Allothrombium fuliginosum*, Herm., all stages of which are described. After hibernating in the surface layer of the soil or under leaves or moss, the adults emerge in March-April and feed on the insect larvae they find in the grass or on trees, etc. The females oviposit 20–30 days after emergence, laying as many as 390 eggs, all in one day, in nests below the surface of the soil. The larvae hatch in 24–27 days. The author records observations of their feeding on a Gryllid, and various Heteroptera, Aphids and thrips.

JELLISON (W. L.) & PHILIP (C. B.). **Faunae of Nests of the Magpie and Crow in western Montana.**—*Canad. Ent.*, lxv, no. 2, pp. 26–31, 12 refs.

GAHAN (A. B.). **Description of a Chalcidoid Parasite of *Protocalliphora* (Hymenop.).**—*T.c.*, pp. 31–33, 1 fig. Orillia, February 1933.

Examination of a nest of the common crow and a number of nests of magpies from south-western Montana revealed the presence of 15 species of insects. The magpie nests were heavily infested with *Protocalliphora avium*, Shan. & Dobr., 373 larvae being taken from one nest containing 4 fledglings. In the crow's nest 47 larvae were found. The Pteromalid, *Mormoniella vitripennis*, Wlk., and the Miscogasterid, *Morodora armata*, gen. et sp. n., which is described in the second paper, were reared from collected puparia of *P. avium*, and parasitism of reared pupae was accomplished in the laboratory with the latter parasite, a second generation of adults being obtained. *Dermestes signatus*, Lec., appeared to be common, and its larvae were observed to attack the puparia of *P. avium*. *Culicoides biguttatus*, Coq., and *C. crepuscularis*, Mall., engorged with blood, were abundant in several inhabited nests. The magpie nestlings all appeared to be healthy, with only minute lacerations on the breast to indicate feeding by the numerous maggots present.

SCHROEDER, jr. (H. O.). **A Note on the Occurrence of the Australian Cattle Tick in Texas.**—*Proc. Ent. Soc. Wash.*, xxxv, no. 2, pp. 23–24. Washington, D.C., February 1933.

Boophilus annulatus australis, Fuller, which was recorded in the United States in February 1912 from the island of Key West, is now well established on the mainland of Florida. In 1931, this variety was found to be abundant at Matamoros, Mexico, and collections of cattle ticks made on the Texas side of the international boundary showed that it is present in two counties in the lower Rio Grande Valley. From collections on the Mexican side it appears to be restricted to a corresponding area ; 90 per cent. of the ticks collected at Matamoros and 30 per cent. of those collected 30 miles further up the river were of the variety *australis*, but beyond that point only the typical *B. annulatus*, Say, was taken.

Stearns (L. A.), MacCreary (D.) & Newhouse (N. P.). **The Problem of Mosquito Control in Delaware.**—*Bull. Delaware Agric. Expt. Sta.*, no. 181, 106 pp., 31 figs. Newark, Del., January 1933.

Details are given of a mosquito survey of Delaware State carried out from May to September 1932. Adults were collected daily throughout this period in 16 representative communities by means of New Jersey mosquito traps of the type incorporating a cyanide jar [*R.A.E.*, B, xx, 241], and searches were also made for breeding-places.

The following is taken from the authors' summary :—A total of 98,922 adult mosquitos were trapped, comprising 28 species ; 4 additional species were caught on the wing or bred from larvae. The group of mosquitos that breed in salt marshes (*Aëdes sollicitans*, Wlk., *A. cantator*, Coq., *A. taeniorhynchus*, Wied., and *Culex salinarius*, Coq.) constituted 41 per cent. of the trapped adults, the house mosquito (*C. pipiens*, L.) 36 per cent., and the remaining 23 per cent. was comprised mainly of *A. vexans*, Mg. (the inland swamp mosquito), *Mansonia perturbans*, Wlk., and the three Anophelines, *Anopheles quadrimaculatus*, Say, the vector of malaria in this region, *A. crucians*, Wied., and *A. walkeri*, Theo. In 1932, rainfall was deficient and temperature abnormally high ; it is assumed that under ordinary conditions the proportion of inland swamp and salt marsh mosquitos would be greatly increased. Unsanitary local conditions, such as water-holding receptacles, open cisterns and cesspools, pools of standing water, and stagnant and polluted drainage ditches and small streams, favour the breeding of *C. pipiens* in varying degrees, and should be dealt with by local organisations. Undrained swampy areas of various kinds scattered throughout the State, which are the breeding-places of *Aëdes vexans*, *M. perturbans* and certain of the Anophelines, should be dealt with by county organisations. The extensive salt marshes bordering the Delaware River and Bay and the Atlantic Ocean, which are frequently and more or less completely inundated by storm tides, are the breeding-places of the enormous numbers of salt marsh mosquitos that are very troublesome not only in the coastal area but for miles inland. This group of mosquitos is by far the most important, but adequate treatment of such extensive areas would necessitate large scale operations, including ditching, diking, hydraulic filling, flooding, etc., which could only be undertaken by the State as a whole. The organisation of a State Commission for this purpose is recommended.

Jepson (F. P.). **Dry-wood-inhabiting Termites as a possible Factor in the Etiology of Sprue.**—*Ceylon J. Sci.*, (D) iii, pt. 1, pp. 3–46, 15 pls., 5 pp. refs., 1 map. Colombo, February 1933.

Medical opinion is divided as to whether sprue is a deficiency disease or is caused by a specific infective organism, possibly a yeast fungus (*Monilia*). The disease is often contracted by several contemporary or successive occupants of one house, and there is an old established belief in Ceylon, where it is endemic, that it originates solely in buildings the woodwork of which is affected by dry-rot. The author, however, has found that true dry-rot, caused by fungi, is rare in Ceylon ; the so-called " dry-rot " is almost always a condition caused by the very common termites that nest in dry wood. They are not found in timber in Ceylon above 3,000 ft. ; at higher altitudes similar damage to woodwork is generally due to beetles. It is suggested that sprue may in some way be caused by the ingestion of the faecal pellets of these termites, which

fall in showers from infested roof-timbers, often on to human food. The intestines of dry-wood termites harbour an extensive Protozoan fauna, comprising representatives of about fifty genera, some of which, such as *Spirochaeta* (*Treponema*), *Trichomonas*, *Balantidium* and *Nyctotherus*, include species important in human pathology. Some of these Protozoa have been found alive in freshly voided pellets. Cases of sprue and allied affections personally investigated by the author all occurred below the 3,000 ft. level and, with one doubtful exception, in bungalows infested with dry-wood termites. The proportion of bungalows so infested in the Island is very large.

A table is given showing the recorded geographical distribution of sprue and of the species of dry-wood termites, including the authority for each record. In the two main world-foci of the disease, Central America (with the West Indies) and south-eastern Asia, these termites are widely distributed. Apart from a certain number of isolated cases, sometimes of doubtful diagnosis, recently reported from northern Europe and the United States, sprue is practically confined to tropical and sub-tropical regions. In some of these, including Burma, Japan and Korea, dry-wood termites have not yet been recorded, but these insects have been very little observed and the records of their distribution are certainly incomplete. They are clearly distinguished from the much more familiar soil-nesting species, which also sometimes attack wood but which void only liquid excreta.

Hirst (L. F.). **Notes on the Bacteriology of " Dry-wood " Termites.**—*Ceylon J. Sci.*, (D) iii, pt. 1, pp. 47–48. Colombo, February 1933.

In view of the possible association between dry-wood termites and disease [see preceding abstract], the abdominal juices and faecal pellets of a number of these termites, collected in Ceylon, were examined for micro-organisms. Several batches of material yielded organisms resembling in some respects streptococci. Other cocci, diphtheroids and spore-bearing bacilli isolated do not warrant detailed study at present. A sample from one bungalow yielded colonies of *Monilia*, a genus of which some species are common concomitants of sprue, but the sample may conceivably have been contaminated externally by " wild " yeasts.

Hirst (L. F.). **A Rat-flea Survey of Ceylon, with a brief Discussion of recent Work on Rat-flea Species Distribution in Relation to the Spread of Bubonic Plague in the East Indies.**—*Ceylon J. Sci.*, (D) iii, pt. 1, pp. 49–113, 2 pls., 4 figs., 32 refs., 1 map. Colombo, February 1933.

This record combines data collected in a survey of Ceylon as a whole in 1930–31 with the results of surveys in Kandy [*R.A.E.*, B, xviii, 121] and in Colombo (1928–29), where a previous survey was made in 1922–24 [xiii, 193]. Tables are given showing the proportionate distribution of the fleas in different localities, in relation to climate, population, etc., and on different rodents, and their relation to plague epizootics and epidemics. The Island is divided into four geographical zones : " low-wet " in the south-west, " low-dry " in the north and east, and " montane " and " sub-montane " in the interior. Data from residential and from commercial premises (bazaars, grain-stores, etc.), where newly imported species of flea are more likely to be found, are carefully distinguished. The rodents chiefly searched were various sub-species of *Mus* (*Rattus*) *rattus*, among which *kandianus* greatly

predominated ; a few fleas were collected from *M.* (*R.*) *norvegicus* in coastal stations and from *Gunomys gracilis* (Ceylon mole-rat). The characteristic indigenous rat-fleas were *Xenopsylla astia*, Roths., in the lowlands, and *Stivalius phoberus*, J. & R., and *Ceratophyllus tamilanus*, J. & R., in the highlands (above 2,000 ft.). Probably imported species found were *Leptopsylla segnis*, Schönh. (above 4,000 ft.) and *Xenopsylla cheopis*, Roths., besides a few examples of *X. brasiliensis*, Baker, *Echidnophaga gallinacea*, Westw., *Ctenocephalides felis*, Bch., and the possibly native *C. felis orientis*, Jord.

At present, the incidence of plague in Ceylon is almost exclusively associated with *X. astia*, the common species in the lowlands, and *X. cheopis*, which is established, especially in the commercial quarters, in Colombo (low-wet zone), Anuradhapura and Trincomalee (low-dry) and Kurunegala (submontane), and predominates at medium elevations in the mountains. It has already been shown [xi, 48, 187] that in Colombo the regional incidence of plague in man is closely correlated with the *cheopis*-index. Outside Colombo, 8 of the 11 recorded rat-epizootics occurred in districts with a *cheopis*-index of over 1·0. The chief exception was at Galle (low-wet zone), where an outbreak of plague was associated, in the absence of *X. cheopis*, with an *astia*-index of 5·67, the highest recorded in the Island. The data show that a rat-epizootic generally follows an invasion of *X. cheopis*, though there may be an interval of at least two years, as in two heavily *cheopis*-infested regions in the lowlands, which have so far escaped plague. Apparently plague may become endemic in an *astia*-area when the *cheopis*-index approaches 1·0, *X. astia* doubtless playing a subsidiary part once the epizootic is started. Evidence from Ceylon and Madras, combined with experimental data [*cf.* xvi, 223 ; xix, 46 ; xx, 27], suggests that an *astia*-index of 6–7 is necessary for independent plague-transmission. Rat-density apart from flea-index appears to be unimportant. The author concludes that throughout Ceylon, as in Madras, Rangoon, and Java, rat-flea species distribution is the paramount factor governing the spread of plague. He believes that the present distribution is due less to climate (though the range of *X. astia*, for instance, is apparently limited by its sensitiveness to cold) than to the evolution of local species in an isolation first broken by commercial relations. He therefore assigns special importance to the rat-proofing or fumigation of cargoes of grain, cotton, etc. [xx, 25].

The method of survey by counting fleas found on rats is imperfect. It makes no allowance for the floating population of fleas at large in rat nests, etc., which includes all ovipositing females and which may vary with differences of species or weather conditions, but even so it may be of value as an indication of danger-spots, of the type of goods most infested, and of the period of lowest prevalence of fleas, when rat-destruction operations should be intensified.

van der Walle (N.). **De ratten en de rattenvlooien van Makassar ; enkele opmerkingen naar aanleiding van de voorgekomen pestgevallen.** [The Rats and Rat-fleas of Macassar ; some Observations made in Consequence of the Cases of Plague there.]—*Meded. Volksgezondheid Ned.-Ind.*, xxi, no. 4, pp. 263–276, 1 map, 10 refs. Batavia, 1932. [Recd. March 1933.]

At Macassar 115 cases of bubonic plague were observed in man between 1922 and 1930, of which 40 occurred in 1924 when the epidemic

reached its peak. Most of the cases were in the harbour quarter and adjoining part of the town, and occurred just before or during the rainy period (October–March). In 1927–29 plague was observed in 18 individuals of *Mus* (*Rattus*) *norvegicus*, 3 of *M.* (*R.*) *concolor*, and 1 of *M.* (*R.*) *rattus diardii*. No infected rats were found in 1930–31. From January 1931 to January 1932, 784 rats, mice and shrews were captured, of which 350 were *M. norvegicus*, 325 *M. concolor*, 69 *M. rattus diardii*, 31 *M. musculus* and 9 *Pachyura murina*. The fleas taken from them totalled 1,636, namely 771 *Xenopsylla cheopis*, Roths. (682 in the harbour quarter) and 865 *X. astia*, Roths. (765 in the town). The numbers of *X. cheopis* and *X. astia* were 150 and 20 respectively on *M. rattus diardii*; 526 and 610 on *M. norvegicus*; 79 and 218 on *M. concolor*; 16 and 2 on *M. musculus*; and 0 and 15 on the shrew, *P. murina*. The presence of quantities of rice, copra, and dried fish in the harbour quarter apparently attracted *X. cheopis*.

Macchiavello Varas (A.). **Ensayo sobre la peste en Chile.** [A Note on Plague in Chile.]—*Bol. Ofic. sanit. panamericana*, xi, no. 9, pp. 909–915. Washington, D.C., July 1932.

Plague appeared in Chile in 1903, and since 1928 attention has been paid to the destruction of rats. In 1930, 86 (17·77 per mille) of the rats and mice in Antofagasta were infected, 54·6 per cent. of these being *Mus* (*Rattus*) *norvegicus*, 25·5 per cent. *M.* (*R.*) *rattus*, 16·4 per cent. *M. rattus alexandrinus*, and 3·5 per cent. *M. musculus*. Infections were commonest in the commercial and harbour quarters. Following the occurrence of 7 cases of plague in man in the summer of 1930, a campaign against rats was initiated, repeated poisoning being the preferred measure. There was an estimated decrease of 70 per cent. in the numbers of rats, only 2 (0·2 per mille) of which were infected, and plague in man disappeared. From 1928 to 1930, 4,703 fleas were examined in Antofagasta. In 1929, 105 live rats harboured 2,029 fleas, the percentages being 57·36 *Xenopsylla cheopis*, Roths.; 12·32 *Leptosylla segnis*, Schönh. (*musculi*, Dug.); 5·25 *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., and *C.* (*C.*) *felis*, Bch.; 9·26 *Echidnophaga gallinacea*, Westw.; 4·73 *Hectopsylla suarezi*, Fox; 10·79 *Pulex irritans*, L.; and 0·4 *Xenopsylla astia*, Roths. The flea-index for the town as a whole averaged 20, that for *M. norvegicus* being 13·33, *M. rattus* 35·16, *M. r. alexandrinus* 31, and *M. musculus* 12·53. The indices for the individual species of fleas were *X. cheopis* 11·08; *L. segnis* 2·38; *C. canis* 1; *E. gallinacea* 1·8; *H. suarezi* 0·9; *P. irritans* 2·08; and *X. astia* 0·047. The index of *X. cheopis* decreased to 7·9 in winter. At Iquique, *X. cheopis*, *P. irritans* and *L. segnis* were present, the indices for the first two being about 4 and 10 respectively.

Edwards (F. W.). **Marquesan Simuliidae.**—*Bull. Bishop Mus.*, xcviii, pp. 103–109, 3 figs., 2 refs. Honolulu, 1932.

Simulium buissoni, Roub., which has been erroneously recorded as occurring in the Society Islands, is a serious pest in some, but not all, of the Marquesas. A careful study made of the fly occurring in the islands in which man was not attacked led to the conclusion that it represented a distinct form, here described as *S. buissoni* var. *gallinum*, n.

Ferris (G. F.). **Ectoparasites of Marquesan Rats.**—*Bull. Bishop Mus.*, xcviii, pp. 117–127, 5 figs., 1 ref. Honolulu, 1932.

Ectoparasites recorded from rats in the Marquesas Islands are the mites, *Echinolaelaps* (*Laelaps*) *echidninus*, Berl., *L. hawaiiensis*, Ewing, hitherto only known from the native rat of Hawaii, and *Listrophoroides expansus*, sp. n., and the Anoplura, *Hoplopleura oenomydis*, Ferris, and *Polyplax spinulosa*, Burm.

Simmons (J. S.), St. John (J. H.) & Reynolds (F. H. K.). **Experimental Studies of Dengue.**—*Monogr. Bur. Sci. Philipp. Is.*, no. 29, viii+489 pp., 3 pls., 159 figs., many refs. Manila, 30th July 1931. [Recd. March 1933.]

This monograph is a reprint of an article already noticed [*R.A.E.*, B, xix, 110], together with a lengthy appendix giving further details concerning the mosquitos and men used in the experiments.

Houdemer (E.). **Observations sur quelques poissons dulcaquicoles culiciphages du Tonkin.**—*Bull. Soc. méd.-chir. Indochine*, x, no. 7, pp. 740–746. Hanoi, October 1932.

Freshwater fish occurring in Tonkin that were found to devour mosquito larvae and pupae in an aquarium were, in order of efficiency, *Anabas scandens*, *Macropodus viridiauratus*, *Carassius auratus* (goldfish), *Rasborinus lineatus*, *Toxabramis houdemeri*, *Culter brevicauda*, and *Barbus hainani*. Further investigations are necessary to ascertain their value in nature, where a very rich plankton is available.

Toumanoff (C.) & Farinaud (M. E.). **Sur la présence de** *A. culicifacies* **en Nord-Annam.**—*Bull. Soc. méd.-chir. Indochine*, x, no. 7, pp. 760–766, 4 pls. Hanoi, October 1932.

The larva and female of *Anopheles culicifacies*, Giles, are described from specimens taken in Annam, this being the first record from Indo-China. Some slight differences from Indian specimens are noted. Its possible importance as a vector of malaria in Annam requires investigation.

Oxer (D. T.). **Infestation of the Horse with Bot Fly Larvae.**—*Tasmanian J. Agric.*, (N.S.) iv, no. 1, pp. 32–34. Tasmania, 1st February 1933.

Notes are given on the bionomics and control of the horse bot-flies, of which *Gastrophilus intestinalis*, DeG., *G. nasalis*, L. (*veterinus*, Clark) and *G. haemorrhoidalis*, L., occur in Tasmania.

Morishita (K.) & Omori (N.). **On the scientific Name of a Mite which occurs in abundance in Houses in Taihoku, Formosa.** [*In Japanese.*]—*Tokyo-Iji-Shimpo* (*Tokyo Med. News*), no. 2801, pp. 2535–2539, 1 pl. Tokyo, November 1932.

Liponyssus nagayoi, Yamada, occurred in abundance in houses in Taihoku in November and December 1931. The mites attack man as well as rats and may be of importance in the spread of disease [*cf. R.A.E.*, B, xix, 156].

Roberts (J. I.) & Tonking (H. D.). **A preliminary Note on the Vector of Tropical Typhus in Kenya.**—*E. Afr. Med. J.*, ix, no. 11, pp. 310–315, 2 refs. Nairobi, February 1933.

Owing to the general association by patients of a tick bite with the site of the primary lesion in tropical typhus in Kenya [*cf. R.A.E.*, B, xix, 40], a survey was made of the animals commonly in contact with human beings and of their ectoparasites. Man is frequently attacked by the larvae and sometimes by adult males of *Rhipicephalus pulchellus*, Gerst., which normally infests the game of the Athi Plains. Although the evidence collected has suggested that this tick might be a vector, numerous transmission experiments all proved negative. On the other hand, an emulsion of a number of *R. sanguineus*, Latr., taken from a house in which a case of tropical typhus had recently occurred produced typical symptoms when inoculated into guineapigs, and subinoculations also gave typical reactions. The dog is the chief host of this tick, but man is readily attacked. The regular removal of ticks from domestic dogs is recommended.

Whitnall (A. B. M.). **The Trypanosome Infections of** *Glossina pallidipes* **in the Umfolosi Game Reserve, Zululand. (Preliminary Report.)**—*18th Rep. Vet. Serv. S. Afr.*, pt. 1, pp. 21–30, 7 figs., 1 fldg. map, 4 refs. Pretoria, August 1932. [Recd. February 1933.]

Dissections of individuals of *Glossina pallidipes*, Aust., trapped in the Umfolosi Game Reserve in Zululand [*cf. R.A.E.*, B, xxi, 22] were begun in November 1931 with a view to ascertaining the percentage showing trypanosomes in the proboscis. It appears that infection is highest in areas where game is most abundant, and that it is higher where there is water and dense vegetation than where the vegetation is sparse. The trypanosomes in the order of their abundance were *Trypanosoma vivax*, *T. congolense* and *T. brucei*. This is the first time that *T. brucei* has been recorded from the salivary glands of *G. pallidipes* in Zululand and demonstrates that it is possible for trypanosomes of this group to occur in areas where trypanosomiasis of cattle is prevalent but sleeping sickness does not occur. Females predominated in the traps in all the localities in the Reserve.

Robinson (E. M.) & Coles (J. D. W. A.). **A Note on** *Aegyptianella pullorum* **in the Fowl in South Africa.**—*18th Rep. Vet. Serv. S. Afr.*, pt. 1, pp. 31–34, 4 figs., 3 refs. Pretoria, August 1932. [Recd. February 1933.]

An organism morphologically indistinguishable from *Aegyptianella pullorum* is recorded from fowls in South Africa. One of the fowls was infested with larvae of *Argas persicus*, Oken, which is believed to be the vector [*cf. R.A.E.*, B, xvii, 204].

du Toit (P. J.) & Bedford (G. A. H.). **Goat Mange.—Infectivity of Kraals.**—*18th Rep. Vet. Serv. S. Afr.*, pt. 1, pp. 145–152, 10 figs. Pretoria, August 1932. [Recd. February 1933.]

In the experiment described, five Angora goats badly infested with *Sarcoptes caprae*, Fürst., were kept for 4½ months in a small stone kraal, during which period two of them died. The other three goats were shorn and removed, their hair being left in the kraal, which remained

empty for 17 days [*cf. R.A.E.*, B, xii, 156]. Six healthy Angora goats were then placed in the kraal and kept there for 10 months, during which time the manure, which had never been removed, was dug up twice. After 21 months from the beginning of the experiment, the goats were still healthy.

CURSON (H. H.). **Distribution of *Glossina* in the Bechuanaland Protectorate.**—*18th Rep. Vet. Serv. S. Afr.*, pt. 1, pp. 197–219, 8 figs., 4 maps, 12 refs. Pretoria, August 1932. [Recd. February 1933.]

Records of the distribution of *Glossina morsitans*, Westw., in the Bechuanaland Protectorate since the early part of the 19th century are surveyed. Prior to 1896, the fly appears to have been widely distributed along the eastern and northern borders and in the Okovango Delta, and evidently extended and receded as at the present day. As a result of the rinderpest outbreak in that year, it apparently receded to unprecedented limits, and for about 12 years there is little evidence of its presence, although the Chobe and Okovango fly areas became definitely recognised. From 1908 until the present day the fly in these areas has been gradually spreading.

Details are given of a few experiments with the Harris fly trap [*R.A.E.*, B, xix, 78] in which 19, 2 and 4 individuals of *G. morsitans* were caught after the trap had been left in different positions for 22½, 24, and 22 hours respectively.

GRAF (H.) & WILKEN-JORDEN (T. J.). **Researches into Dips and Dipping. A.—Lime-Sulphur Dips. Paper I: General Introduction. Lime-Sulphur Dips.**—*18th Rep. Vet. Serv. S. Afr.*, pt. 2, pp. 1005–1014, 1 map, 9 refs. Pretoria, August 1932. [Recd. February 1933.]

The following is the authors' summary: A general introduction to the subject of dips and dipping is given, followed by a discussion of the past and present use of lime-sulphur dips in South Africa as a means of combating sheep scab [*Psoroptes ovis*, Hering]. A programme of research into the various phases of lime-sulphur dips has been drawn up and reproduced here in its broadest outline.

WILKEN-JORDEN (T. J.). **Researches into Dips and Dipping. A.—Lime-sulphur Dips. Paper II. A New Laboratory Method of Chemical Analysis.**—*18th Rep. Vet. Serv. S. Afr.*, pt. 2, pp. 1015–1027, 1 graph, 26 refs. Pretoria, August 1932. [Recd. February 1933.]

The following is the author's summary: A review of the literature relating to the analysis of sulphides, polysulphides and allied substances is given. Various analytical methods have been tested, while others are still under investigation. For the analysis of field and laboratory polysulphide solutions, a new volumetric cadmium acetate method has been evolved, the monosulphide equivalent being precipitated as cadmium sulphide and titrated iodometrically, while the free polysulphide sulphur is titrated as thiosulphate after conversion with sulphite. The thiosulphate is titrated in the filtrate, while the total sulphur is determined gravimetrically. Some of the reactions involved have been studied experimentally.

Wilken-Jorden (T. J.). **Researches into Dips and Dipping. A.—Lime-sulphur Dips. Paper III.—A preliminary Study of a colorimetric Method as a rapid Means of Control of Polysulphide Solutions.**—*18th Rep. Vet. Serv. S. Afr.*, pt. 2, pp. 1029–1035, 3 refs. Pretoria, August 1932. [Recd. February 1933.]

The following is the author's summary: A solution of pure chromic acid in water was found to be well suited as a standard of comparison for the colorimetric determination of calcium polysulphides in solution. With certain polysulphide solutions under adequately controlled conditions, the colorimetric comparison method yields excellent results, whereas other polysulphide solutions give both low and high values, depending on various factors as yet not fully elucidated.

Galliard (H.). **Glossines du Gabon Occidental.**—*Ann. Parasit. hum. comp.*, xi, no. 2, pp. 81–92, 1 fig., 1 map, 2 refs. Paris, 1st March 1933.

In the course of investigations carried out during the dry season and part of the wet season in western Gabun in 1930, five species of *Glossina* were taken, *viz.*, *G. palpalis*, R.-D., *G. fusca*, Wlk., *G. tabaniformis*, Westw., *G. pallicera*, Big., and *G. haningtoni*, Newst. & Evans. The last two species are recorded for the first time from this region, only one example of each being obtained. During the dry season, *G. fusca* was only observed in the forests, where it was more abundant than *G. palpalis*. It was active during the daytime and was found at varying distances from water-courses according to the season; it is suggested that this may be explained by variations in atmospheric humidity. *G. tabaniformis* was abundant on the coast and at certain points in the savannah, and at the time of investigation appeared to seek water but avoid shade. During the dry season, it was diurnal, but in October, at the time of the first heavy rains, it was nocturnal, and every evening entered huts, attracted by the light.

Glossina palpalis was by far the most abundant species throughout the region. During the dry season, it was always found near water, and although seeking moderate shade, it never penetrated forests where the shade was dense. It is possible that its habits are modified during the rainy season, as in other regions it has been found during the rains in areas with no vegetation. Its numbers appear to increase at the beginning of the rains towards the middle of September, when the heavy downpours are intermittent and the humidity and temperature both rise, but decrease towards the beginning of October, when the precipitation is constant and the soil becomes unfavourable for the development of the pupae. It seems improbable that there are important seasonal migrations, owing to the persistence of favourable conditions throughout the dry season. Regarding the distance for which this fly will follow man, it was never observed to leave the immediate vicinity of the water, particularly when the forest was thick, and did not occur beyond the border of the forest. During the day it was never transported by natives, but every evening the water carriers brought some flies back, sometimes from considerable distances (875 and 1,300 yards). Only under these conditions did they penetrate huts at night, attracted by the light. In one locality, about a dozen males were caught in a hut in four evenings.

The proportion of males was, with few exceptions, lower than that of females, but the author's observations do not confirm Fiske's theory [*cf. R.A.E.*, B, viii, 131], since although it is possible that favourable hosts were rare, there was no absence of suitable shelters. Observations in September, at the beginning of the rains, showed that although the proportion of males was always lower than that of females, there were daily variations, the ratio being 37 : 100 in the morning, 28 : 100 about 1 o'clock, and 46 : 100 in the evening, when the absolute number of males also increased. It is suggested that the males are more active at the lower temperatures in the morning and evening. From this it can be seen that the number of males is not diminished by captures during the early hours as Fiske believed, and when catching is carried out for several days in succession, the total number of flies decreases little and the proportion of males remains constant for a given hour. Thus Fiske's theory that the females in a given locality are constantly renewed from elsewhere is confirmed, but must also apply to the males, which he believed to remain in one spot and so to become diminished by capture.

LANGERON (M.) & GALLIARD (H.). **Deux types de larves d'*Anopheles* nouveaux pour la Corse.**—*Ann. Parasit. hum. comp.*, xi, no. 2, pp. 93–95, 1 fig. Paris, 1st March 1933.

A list is given of the Anophelines of Corsica [*R.A.E.*, B, xiv, 14; xvii, 65]. When revising a collection of mosquito larvae made in 1925, two types new to this Island were discovered, one being the larva of *Anopheles marteri*, Sen. & Prun. [xvi, 189] and the other a third stage larva that may be a new species or an abnormal specimen of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) or *A. marteri*.

VENHUIS (W. G.). **Een nieuwe varieteit van de superspecies *An. punctulatus*.** [A new Variety of *A. punctulatus*.]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxiii, no. 4, pp. 203–206, 5 figs. Batavia, 14th February 1933.

SOESILO (R.) & VAN HELL (J. C.). ***Anopheles punctulatus* var. *novaguinensis*, Venhuis, 1932.**—*T.c.*, pp. 207–208, 2 figs.

Descriptions are given of the larva and adults of both sexes of *Anopheles punctulatus* var. *novaguinensis*, n., collected in Netherlands New Guinea, where it was breeding in a pool in a sago forest. The second paper discusses the characters distinguishing the new variety from *A. punctulatus* var. *moluccensis*, Sw.

PEARSON (A. M.), WILSON (J. L.) & RICHARDSON (C. H.). **Some Methods used in testing Cattle Fly Sprays.**—*J. Econ. Ent.*, xxvi, no. 1, pp. 269–274, 1 fig., 4 refs. Geneva, N.Y., February 1933.

The following is the authors' abstract : Existing methods of testing cattle fly sprays for their repellent efficiency on the stable fly, *Stomoxys calcitrans*, L., are unsatisfactory. A method, which consists essentially of making close observations on sprayed cows of previously determined fly susceptibility, gave much better results. Thirty-five selected cows were used in determining the relative efficiency of 6 fly sprays. The

cows were scrubbed with soap and water, then staked individually in a pasture, being removed only for watering and milking. The normal fly susceptibility of each cow was obtained from the average of counts of the number of flies present, made hourly from 7 a.m. till 3 p.m. for a period of 3 days. The cows were then placed in 7 groups of 5 each, the maximum difference in the number of flies per cow per count between the groups being about two. The 6 spray materials were then assigned by chance to each of 6 groups of 5 cows ; the remaining group served as the control. Each cow was sprayed at 6 a.m. daily for 4 consecutive days with 2 fl. oz. of spray material applied with an electric sprayer. The fly susceptibility of the sprayed and control cows was determined as before. The results show that close individual observations of a relatively few cows of known fly susceptibility give more consistent and dependable results than less accurate observations on a large number of cows. The population of stable flies on unsprayed dairy cattle increases from 7 a.m. till about mid-day, after which it tends to become stationary.

WHITEHEAD (W. E.). **Parasites from a Bird's Nest.**—*J. Econ. Ent.*, xxvi, no. 1, pp. 292–293. Geneva, N.Y., February 1933.

Of the insects collected in Canada from the vacated nest of a pair of purple martins (*Progne subis*), the most numerous were the flea, *Ceratophyllus idius*, J. & R., and *Protocalliphora splendida*, Macq., 92·74 per cent. of the 121 pupae of this fly being parasitised by the Pteromalid, *Mormoniella vitripennis*, Wlk. One adult and several larvae of *Dermestes lardarius*, L., and three Psocids, *Liposcelis* (*Troctes*) *divinatorius*, Müll., were also taken.

SEGAL (B.). **Why not Bourgault's Trap for Horse-flies ?**—*J. Econ. Ent.*, xxvi, no. 1, pp. 301–302. Geneva, N.Y., February 1933.

The various types of injury caused to live-stock by Tabanids are briefly summarised, and it is suggested that the fly-trap found effective against *Stomoxys* in Mauritius [*R.A.E.*, B, xviii, 90] might be adapted for their control. Whereas *Stomoxys* frequents barns and stables and at times enters dwellings, Tabanids are primarily flies of the green field, swamps and wooded areas, and very seldom enter buildings. During the time in which they are feeding on cattle, however, which lasts about 10 minutes, they are not easily disturbed, so that if the animals could be trained to go through the trap automatically when attacked, as they are said to do in Mauritius, the flies would be brushed off and trapped while feeding.

PAPERS NOTICED BY TITLE ONLY.

FLINT (W. P.) & METCALF (C. L.). **Insects, Man's Chief Competitors.**—Cr. 8vo, viii+133 pp., 9 figs., 3 pls. Baltimore, The Williams & Wilkins Co. ; London, Baillière, Tindall & Cox, 1932. Price 5*s*. 6*d*. [Recd. April 1933.] [See *R.A.E.*, A, xxi, 255.]

BEDFORD (G. A. H.). **Description of *Argas striatus*, a new Species of Tick** [from Cape Province].—*18th Rep. Vet. Serv. S. Afr.*, pt. 1, pp. 221–222, 2 figs. Pretoria, August 1932. [Recd. February 1933.]

BEDFORD (G. A. H.). **A Synoptic Check-list and Host-list of the Ectoparasites found on South African Mammalia, Aves, and Reptilia. (Second Edition.)**—*18th Rep. Vet. Serv. S. Afr.*, pt. 1, pp. 223–523, 26 figs., 9 pp. refs. Pretoria, August 1932. [Recd. February 1933.] [*Cf. R.A.E.*, B, xv, 90.]

KRIJGSMAN (B. J.) & PONTO (S. A. S.). **Zwei neue** *Haemaphysalis***arten, sowie über das Männchen von** *Ixodes granulatus* **Supino.** [Two new Species of *Haemaphysalis* (*novae-guinae* from New Guinea and *monospinosa* from the Riou Archipelago) with Notes on the Male of *I. granulatus*.]—*Z. Parasitenk.*, v, no. 2, pp. 407–411, 3 figs., 2 refs. Berlin, 16th February 1933.

[PAVLOVSKIĬ] PAWLOWSKY (E. N.) & STEIN (A. K.). **Ueber die Wirkung von** *Dermanyssus gallinae* **auf die Hautung des Menschen.** [On the Effect of *D. gallinae*, DeG., on the Skin of Man.]—*Z. Parasitenk.*, v, no. 2, pp. 421–424, 2 figs. Berlin, 16th February 1933.

[ZASUKHIN (D.) & TIFLOV (V. E.).] SASSUCHIN (D.) & TIFLOW (W.). **Endo- und Ektoparasiten des Steppenziesels** (*Citellus pygmaeus* **Pall.**) **im süd-osten RSFSR.** [Endo- and Ectoparasites of *C. pygmaeus* in South-eastern Russia.]—*Z. Parasitenk.*, v, no. 2, pp. 437–442, 2 pp. refs. Berlin, 16th February 1933. [*Cf. R.A.E.*, B, xx, 250.]

FERRIS (G. F.). **New Species and other Records of Mallophaga from the Marquesas.**—*Bull. Bishop Mus.*, xcviii, pp. 53–72, 20 figs. Honolulu, 1932.

WERNECK (F. L.). **Sobre uma nova especie de Anoplura parasita de lhama** [*Microthoracius mazzai*, sp. n., on *Auchenia huanaca* in Argentina].—*Rev. med.-cirurg. Brasil*, xl, no. 12, pp. 346–348, 2 figs. Rio de Janeiro, December 1932.

WAGNER (J.). **Fünf neue palaearktische Flöhe.** [Five new Palaearctic Fleas.]—*Konowia*, xi (1932), no. 4, pp. 273–280, 5 figs. Vienna, 15th March 1933.

MARSHALL (J. F.) & STALEY (J.). *Theobaldia* (*Culicella*) *litorea* (**Shute**) **n. sp.** (**Diptera, Culicidae**) [*morsitans* var. *litorea* (*R.A.E.*, B, xvi, 176) raised to specific rank].—*Parasitology*, xxv, no. 1, pp. 119–126, 2 figs. Cambridge, 4th March 1933.

LANDROCK (K.). **Die Bremsen (Tabanidae) Mährens.** [The TABANIDAE of Moravia.]—*Verh. naturf. Ver. Brünn*, lxiii (1931), pp. 133–151, 3 figs. Brünn, 1932.

KLIGLER (I. J.) & ASCHNER (M.). **Cultivation of Rickettsia-like Microorganisms from certain Blood-sucking Pupipara** [*Melophagus ovinus*, L., *Lipoptena caprina*, Aust., *Hippobosca equina*, L., and *H. capensis*, Olfers].—*J. Bact.*, xxii, pp. 103–114, 2 pls., 16 refs. Baltimore, Md., 1931.

RICHARDSON (H. H.). **Extractive Efficiency of Kerosene on Pyrethrum Powders of varying Fineness.**—*J. Econ. Ent.*, xxvi, no. 1, pp. 252–259, 1 fig., 11 refs. Geneva, N.Y., February 1933. [See *R.A.E.*, A, xxi, 247.]

LEESON (H. S.) & MELLANBY (K.). **Insects and Micro-climates.**—*Nature*, cxxxi, p. 363. London, 11th March 1933.

It is well known that water exposed to dry air is cooled by evaporation, the rate of which is proportional to the saturation deficiency of the air. In the authors' experiments, when the humidity of air at 30°C. [86°F.] was 78 per cent., the temperature of water in a dish was 27·9°C. [82·22°F.]; when the humidity was 40 per cent., the water temperature was 22°C. [71·6°F.]. The air immediately above the dish had approximately the same temperature as the water. Since experiments have shown that *Culex fatigans*, Wied., is killed by exposure to 41°C. [105·8°F.], its survival in climates where the shade temperature often exceeds this may be due to its habit of resting in damp situations.

The large fall in temperature due to evaporation means that the conditions to which many insects are exposed are even more different from those measured by standard meteorological methods than is usually recognised. If, as found in the authors' experiments, a 2·5 mm. saturation deficit gives a reduction of 1°C. [1·8°F.], then in air at 35°C. [95°F.] with a relative humidity of 90 per cent., the water temperature would be 33°C. [91·4°F.], whereas in air at 40°C. [104°F.] with 10 per cent. humidity, the water temperature would only be 20°C. [68°F.]. Hence an increase of atmospheric humidity may be actually injurious even to insects that have been shown to be capable of enduring a higher temperature in moist air than in dry.

YORKE (W.), MURGATROYD (F.) & HAWKING (F.). **Effect of Passage through *Glossina* on the Resistance of a tryparsomide-fast Trypanosome.**—*Brit. Med. J.*, no. 3761, pp. 176–179, 7 refs. London, 4th February 1933.

The following is taken from the authors' conclusions. In the authors' opinion their experiments with strains of *Trypanosoma brucei* in *Glossina morsitans*, Westw., and *G. palpalis*, R.-D., yielded unequivocal evidence that the acquired character of arsenic-resistance in trypanosomes is transmitted unimpaired through the biological cycle of the parasite in *Glossina*. This fact has an obvious bearing on the question of treating sufferers from sleeping sickness in the presence of the tsetse-fly, and especially on the prophylactic measure, much favoured by the French, of wholesale atoxylisation of patients in their villages [*cf.* *R.A.E.*, B, xviii, 264].

SWYNNERTON (C. F. M.). **Some Traps for Tsetse-flies.**—*Bull. Ent. Res.*, xxiv, pt. 1, pp. 69–102, 3 pls., 4 diagr. London, March 1933.

The following is largely taken from the author's summary: More than twenty new forms and variations of traps that have been tested against *Glossina palpalis*, R.-D., in Kenya Colony and *G. pallidipes*, Aust., *G. morsitans*, Westw., and *G. swynnertoni*, Aust., in Tanganyika Territory are described. The reactions of the various species to the different types of trap varied to a great extent. Flies have been found to react most strongly to the scent of an invisible animal placed in a trap. It is not known whether this attraction is exercised from a distance or whether it merely incites flies that have arrived to enter the traps in larger numbers. If the attraction be a long-range one,

the flies do not distinguish between the source of the odour and conspicuous objects near, since they enter a trap, even of a type not usually attractive, in greatly increased numbers when cattle are in its neighbourhood.

The following traps have been most effective: a screen carried by boys, from which the flies are removed by means of a net ; a plain oblong screen stiffened by a framework and hanging from a catching cage with an awning projecting from the base at each side, which was excellent for *G. palpalis* and *G. pallidipes* ; traps having rollers to carry the flies to the opening of the catching cage, in which a small horizontal cloth-covered drum revolved by a wind-driven propeller is substituted for the upper part of the pendant screen, or in which the screen consists of a wide band of cloth revolving round two small rollers (these two types were promising against *G. swynnertoni*), or the entire screen is replaced by a larger revolving drum (this type was of value against *G. morsitans* and *G. swynnertoni*), or by a small revolving drum with a superimposed catching cage surmounted on each side by large oblong screens diverging towards the top ; a tent-like trap with catching cages on the sides, or an oblong box-like enclosure having the two long sides diverging towards the top with catching cages along their top edges, in both of which animals were kept as bait ; and an electric trap for the backs of lorries, guards' vans on trains, etc., in which the flies are stunned by the current and fall into a tray of oil (it is impossible to kill the flies with a voltage utilisable in practice). In addition, two screens hinged at the bottom and diverging outwards with catching cages along their top-edges or a single screen in which the top section was replaced by two small screens diverging outwards towards the edges of the catching cage proved effective against *G. pallidipes* and caught fair numbers of *G. swynnertoni*. The Harris trap [*R.A.E.*, B, xix, 78] was tested and found excellent for *G. pallidipes*; it was less effective for the other species and apparently no better for *G. pallidipes* than some of the traps here described, which are very much cheaper to make.

Success in trapping with sight traps depends on hunger conditions. This is markedly so for *G. morsitans*, *G. swynnertoni* and (perhaps less) *G. pallidipes*, and apparently considerably less so for *G. palpalis*. It is believed that *G. palpalis*, with its linear distribution and its readiness to come to traps even in the rainy season, will be a particularly favourable subject for attack by trapping. *G. pallidipes* is the next most favourable, and *G. morsitans* and *G. swynnertoni* the least so, although promising traps have now been found for them, the chief difficulties being the limited hunger season and the great extent of the fly belts. Hunger is affected primarily by meteorological conditions (apparently atmospheric humidity in particular) and secondarily by the presence of food animals ; it is high in the late dry season and practically absent in the rains, especially during April. Thus it is believed that only in a year of exceptional drought could a trapping campaign throughout the year be effective against the last two species, at least under conditions in Tanganyika. Even for *G. palpalis* it may be necessary to use natives with hand-screens, or scent traps, or a localised destruction of food animals at the end of the trapping campaign. It is now important to discover a scent attractive to the flies that is not dependent on the presence of an animal and is not too evanescent for use in traps. C. B. Symes in Kenya Colony has already made extracts in alcohol and ether from the sebaceous and other glands of a steer and a bull,

which, when placed in small quantities in the screen cages with awnings, doubled or trebled the catch on each of the days on which they were tried, and lasted for more than a week.

Martini (E.), Mayer (F.) & Weyer (F.). **Ueber die Durchwinterung unserer** *Anopheles maculipennis*. [On the Hibernation of *A. maculipennis* in Germany.]—*Riv. Malariol.*, xi, no. 6, pp. 753–784, 3 graphs, 11 refs. Rome, 1932. [Recd. March 1933.]

Anopheles maculipennis, Mg., generally hibernates in cellars in Germany and in animal quarters in Holland and elsewhere. In the territory of Hamburg, however, females in winter can always be taken in animal quarters at Cuxhaven, though nearer Hamburg itself they are not found there and hibernate in cellars. It is considered that the Dutch theory of races [*R.A.E.*, B, xv, 145, etc.] affords a possible explanation of this discrepancy. The Dutch authors' distinction by wing-length has, however, been abandoned by Hackett, Missiroli and Martini in favour of the markings and structure of the egg [xx, 57, 211].

The present study was made from August 1931 to April 1932 with the race having grey eggs (var. *labranchiae*, Fall.) and that having dark ones, which correspond to those previously termed banded or barred (var. *messeae*, Fall.). The former was studied in the Emden region, where, as in the island of Neuwerk near Cuxhaven, it is almost the only form, and the latter chiefly at Friedrichsmoor near Schwerin, though females from other parts of Germany were also used. Observations on eggs before and after deposition and on the winter habits and fat-bodies of the adults are recorded and discussed at considerable length.

The following conclusions were reached: On beginning hibernation both races separate from the hosts on which they feed, but *labranchiae* does not leave the buildings in which it had fed and, if cattle are available, feeds occasionally throughout the winter, whereas *messeae* migrates from animal quarters and hibernates completely. In December the fat-content is equal in both races, and decreases in *labranchiae* only a little faster than in *messeae*. The latter normally began to hibernate about 16th September, though its entrance into hibernation was sometimes influenced by the environment. If animals were not available, *labranchiae* also hibernated completely, and it would appear that the differences in winter activity in the two races are largely a consequence of the different microclimates of the winter quarters they select. Females of *labranchiae* in animal quarters ended hibernation a little before those with complete hibernation or those of *messeae*. In the region of the Rhine *messeae* disappeared from low-lying localities in winter and hibernated in the hills, a case parallel to that of *A. sacharovi*, Favr (*elutus*, Edw.) in Palestine [xix, 123].

Piccininni (F.). **Relazione sulla campagna antimalarica in Provincia di Milano nell'anno 1931.** [Report on the antimalarial Campaign in the Province of Milan in 1931.]—*Riv. Malariol.*, xi, no. 6, pp. 839–876, 2 maps, 11 refs. Rome, 1932. [Recd. March 1933.]

The campaign included drainage on a large and small scale and measures against Anopheline larvae, such as dusting with Paris green. Almost all the Anophelines found were *Anopheles maculipennis*, Mg.

Rice is cultivated extensively, the fields and channels associated with them being currently regarded as the main source of Anophelines. Examination showed that fields with a continuous or periodic circulation and change of water produced only a few first and second instar larvae that were then swept away into the channels. The latter were often important foci of infestation, but control measures can be applied in them. In the rice-fields that are established on permeable ground and have a scanty supply of water of a very low temperature, however, there is no outflow, as water is merely introduced to make up losses, and not completely changed as its low temperature is harmful to the plants. In such fields larvae and pupae are abundant and control measures are impossible.

In view of the fact that malaria has decreased progressively in the province in spite of the abundance of Anophelines, their food-preferences were investigated by Prof. G. Sollazzo in the district of Lodi. *A. maculipennis* was the only species found in dwellings and animal quarters. Of 172 females taken in bedrooms of farms with animal quarters, 64 had fed on man, 100 on cattle, 6 on horses (which are not numerous and are stabled with the other domestic animals), and 2 on pigs. Of 155 females taken in animal quarters, 8 had fed on man, 134 on cattle, 9 on horses, and 4 on both man and cattle. The protective influence of animals was clearly evident, but largely depended on the distance between the dwellings and animal quarters, since in bedrooms within 20 yards of animal quarters 6 mosquitos had fed on man and 84 on animals, whereas in those 100–200 yards from animal quarters the corresponding figures were 58 and 24. The fact that mosquitos that had fed on both man and animals were only found in animal quarters indicates that mosquitos that have fed in animal quarters do not bite man in dwellings.

Cowdry (E. V.) & Danks (W. B. C.). **Studies on East Coast Fever. II. Behaviour of the Parasite and the Development of distinctive Lesions in susceptible Animals.**—*Parasitology*, xxv, no. 1, pp. 1–63, 10 pls., 2 diagr., 4 charts, 78 refs. Cambridge, 4th March 1933.

In the course of this paper, in which further work on *Theileria parva* causing African coast fever of cattle is described [*cf. R.A.E.*, B, xx, 137], an account is given of the changes in the skin of the host animal caused by the feeding of the transmitting tick, *Rhipicephalus sanguineus*, Latr.

Tate (P.) & Vincent (M.). **The Action of Plasmoquine on Mosquito-induced Malaria of Birds.**—*Parasitology*, xxv, no. 1, pp. 96–101, 11 refs. Cambridge, 4th March 1933.

The following is the authors' summary : The experiments described show that plasmoquine is very effective in preventing or delaying attacks of malaria in birds infected with *Plasmodium praecox* (*relictum*) by direct blood inoculation, but has little or no prophylactic action in birds infected by the bites of mosquitos [*Culex pipiens*, L.].

In the mosquito-induced malaria, parasites may appear in the blood 3 or 4 days after the cessation of plasmoquine treatment, and there is no appreciable delay as compared with untreated birds.

SWEZEY (O. H.). **Summary of Insect Conditions in Hawaii for 1932.**—*Insect Pest Surv. Bull.*, xii, no. 10, pp. 429–431, multigraph. Washington, D.C., U. S. Dept. Agric., Bur. Ent. [1933.]

The first positive evidence of the establishment of *Hypoderma lineatum*, Vill. (ox warble fly) was obtained in November with the discovery of perforated hides freshly removed from cattle said to have been born on the island of Hawaii. Workers at the slaughter house stated that they had previously found perforations and the warbles themselves in hides, though never so abundantly as in this instance, where 10 or more occurred in a single skin.

DYER (R. E.), CEDER (E. T.), RUMREICH (A.) & BADGER (L. F.). **Endemic Typhus of the United States.**—*J. Infect. Dis.*, li, no. 1, pp. 137–161, 15 figs., 27 refs. Chicago, Ill., 1932.

A brief account is given of the work that has been carried out in the United States and Mexico on endemic typhus from the time of its discovery in 1911, with details of experiments carried out by the authors on the transmission of the disease from rat to rat by the rat flea, *Xenopsylla cheopis*, Roths. [*R.A.E.*, B, xix, 221, 257].

DAVIS (N. C.). **Attempts to transmit Yellow Fever Virus with** *Triatoma megista* (**Burmeister**).—*J. Parasit.*, xix, no. 3, pp. 209–214, 8 refs. Lancaster, Pa., March 1933.

In experiments with *Triatoma megista*, Burm., and yellow fever in Brazil, injections into monkeys (*Macacus rhesus*) of crushed nymphs and larvae at varying periods after the infecting feed produced the following results : fatal infection after 3–6 days ; fever and immunity after 7 ; immunity without fever after 8–10 ; and no effect after 14. Three experiments in which infected bugs fed on fresh monkeys after an incubation period and three injections with the faeces of infected bugs all gave negative results. In one experiment out of four fatal infection was transmitted mechanically by the bites of bugs transferred after an interrupted blood meal on an infected animal. It is concluded that only by a rare chance can yellow fever be transmitted by *T. megista.* Indecisive or negative results previously obtained with other insects are compared [*R.A.E.*, B, xix, 83 ; xx, 269, etc.].

RUSSELL (P. F.). **Automatic Distribution of Paris Green for Malaria Control.**—*J. Parasit.*, xix, no. 3, pp. 215–224, 6 figs., 9 refs. Lancaster, Pa., March 1933.

After briefly discussing the difficulties of malaria control in the Tropics, the author points out that it has never been successfully effected by measures that did not include an attack on Anopheline mosquitos. He describes experiments in the Philippines with a machine designed to obviate the cost and unreliability of Anopheline control by native hand-labour. It consists of a hopper with a spout and baffle-board below, and when fixed above a stream, automatically dusts it with a mixture of sand and Paris green (99 : 1), at an average rate of 180 c.c. a minute. It destroyed the great majority of Anopheline larvae for more than 300 yards down a stream 3–8 ft. wide.

Alicata (J. E.) & Jones (M. F.). **The Dung-Beetle,** *Ataenius cognatus*, **as the Intermediate Host of** *Hymenolepis cantaniana.*—*J. Parasit.*, xix, no. 3, p. 244, 1 fig. Lancaster, Pa., March 1933.

Cysticercoids of the tapeworm, *Hymenolepis cantaniana*, found in the body cavity of *Ataenius cognatus*, Lec., developed and reached sexual maturity in chicks, but not in a rabbit or mouse. In one of the naturally infected beetles 1,663 cysticercoids were found and in another beetle 2,217.

Cuvillier (E.). **A new Intermediate Host for** *Cheilospirura hamulosa*, **the Gizzard Worm of Poultry.**—*J. Parasit.*, xix, no. 3, pp. 244–245. Lancaster, Pa., March 1933.

Eggs of *Cheilospirura hamulosa* apparently developed to the larval stage in five of nine grasshoppers (*Paroxya clavuliger*, Serv.) fed on them, but the infestation was slight and the larvae failed to develop further in fowls.

Cuvillier (E.) & Jones (M. F.). **Two new Intermediate Hosts for the Poultry Cestode,** *Hymenolepis carioca.*—*J. Parasit.*, xix, no. 3, p. 245. Lancaster, Pa., March 1933.

Segments of *Hymenolepis carioca*, fed to the Coprid, *Onthophagus janus*, Panz., collected in Maryland, had developed to cysticercoids in 33 days. In a fowl fed on some of the cysts and examined 19 days later, mature or nearly mature specimens of *H. carioca* were found, but no gravid segments.

A chick, fed on cysticercoids found in a naturally infected specimen of *O. pennsylvanicus*, Har., was found dead after 25 days, apparently killed by other fowls. It was found to be heavily infested with *H. carioca.*

Roberts (F. H. S.). **The External Parasites of Sheep.**—*Queensland Agric. J.*, xxxix, pt. 2, pp. 84–90, 5 figs. Brisbane, February 1933.

Notes are given on the appearance, life-history and control of *Bovicola ovis*, L. (*Trichodectes sphaerocephalus*, Olf.), *Linognathus pedalis*, Osb., *Melophagus ovinus*, L. [*cf. R.A.E.*, B, xiii, 102–3, etc.], and *Ixodes holocyclus*, Neum. [xiii, 28]. *Boophilus annulatus australis*, Fuller, *Rhipicephalus sanguineus*, Latr., and *Hyalomma aegyptium*, L., are rare on sheep in Queensland, and scab mites [*Psoroptes ovis*, Hering] are unknown.

Tillyard (R. J.) & Seddon (H. R.). **The Sheep Blowfly Problem in Australia, Report No. 1.**—*Pamph. Coun. Sci. Industr. Res. Aust.*, no. 37; also *Sci. Bull. N.S.W. Dept. Agric.*, no. 40, 136 pp., 15 figs., 6 pls., 5 pp. refs. Melbourne, January 1933.

This report constitutes the first general statement issued by the Joint Blowfly Committee since its appointment in 1928 by the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture. It comprises a comprehensive review of the knowledge accumulated as the result of the extensive research that has been carried out on the bionomics of the blow-flies that infest sheep in Australia and on their control. The work effected previous to the inauguration of the Committee is discussed, and the main lines of its present activities are indicated.

Galli-Valerio (B.) & Nicolle (A.). **Observations sur la biologie et les maladies du renard argenté.**—*Bull. Soc. vaud. Sci. nat.*, lvii, no. 231, pp. 557–586, 12 refs. Lausanne, 31st December 1932.

This article on the breeding of silver foxes includes sections dealing with their parasites. The flea, *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., though of little importance in the case of adults, may seriously affect the cubs and cause deterioration of the fur. *Chaetopsylla* (*Vermipsylla*) *globiceps*, Tasch., is sometimes found on young foxes, and the mite, *Chorioptes vulpis*, Még., which occurs in the external ear, may cause serious loss.

Liquid remedies against the fleas may damage the fur, but a proprietary dust containing derris gives good results, if at the same time the cages are freed from the early stages by painting with a 5 per cent. solution of warm creoline, 2 or 3 treatments at intervals of 2 days being sufficient. Against the mite a mixture of oils of caraway, cinnamon and almonds (1 : 1 : 10) is effective.

Kingscote (A. A.). **Myiasis in Ranch-raised Foxes.**—*62nd Ann. Rep. Ent. Soc. Ontario 1931*, pp. 91–93. Toronto, 1932. [Recd. March 1933.]

Several cases of infestation of foxes by larvae of *Lucilia* have been observed in Prince Edward Island, New Brunswick and Ontario during the summers of 1927–31. All occurred in animals suffering from infectious diseases, serious infestations usually resulting in death after 2–3 days. Four larvae taken from a subcutaneous position on the abdomen of a normal, four-month-old fox puppy proved to be *Wohlfahrtia vigil*, Wlk. Similar infestations were observed on the thighs of young mink.

The larvae of *Lucilia* produce a variety of serious lesions, but there are no records of these in healthy foxes. The general conditions in foxes accompanying such diseases as paratyphoid and distemper afford excellent opportunity for the adults to oviposit. Oviposition usually takes place in the thin-skinned moist areas, the most common being the commissures of the mouth and the perineal region. The young larvae enter the mouth, penetrate the external auditory meatus, or burrow under the skin, the exudates from subcutaneous burrowing attracting larvae from other parts. Proteolytic organisms are carried in during the burrowing, which assure the larvae suitable food. In auditory infestations, the tympanum is destroyed, the middle ear is invaded by larvae and putrefying bacteria, and eventually the brain is involved and cerebro-spinal meningitis results. A collection of 185 larvae from living and dead foxes yielded 137 adults of *Lucilia caesar*, L.

All suitable breeding places, such as manure, dirt and straw from the sheds, and waste food, should be removed from the ranches, and careful sanitary methods should be practised. Fly traps and screens may be utilised. Sick animals should be protected from attack by repellents and medicated ointments applied to parts where oviposition is likely to take place. Pyrethrum-kerosene lightly sprayed on the fur 2–3 times daily is satisfactory and does not injure the animal. The floors should be dusted with slaked lime.

FLETCHER (F.) & HAUB (J. G.). **Digestion in Blowfly Larvae, *Phormia regina* Meigen, used in the Treatment of Osteomyelitis.**—*Ohio J. Sci.*, xxxiii, no. 2, pp. 101–109, 1 fig., 24 refs. Columbus, Ohio, March 1933.

The rearing of blow-fly larvae for the treatment of osteomyelitis [*cf. R.A.E.*, B, xx, 125–129] and the investigation of their activities within the wound necessitates a study of their digestive processes. Larvae of *Phormia regina*, Mg., reared from the egg aseptically on autoclaved beef, remained over 2 weeks at a size corresponding to the 2nd or 3rd instar and then died [*cf.* xx, 162, 231]. Those reared on autoclaved beef which had afterwards been recontaminated with bacteria [*cf.* xii, 64] and those reared aseptically on beef sterilised by heating for 30 minutes at about 75°C. [167°F.] on 4 successive days developed normally, pupating on the 5th day. In the digestive tracts of larvae reared aseptically, the only enzymes found were amylase, lipase, trypsin and erepsin, and the sole difference in contaminated larvae was that invertase also was found in one test out of three, suggesting that the hydrolysis of sucrose was probably caused by bacteria and not by the enzyme.

FOX (H. Munro) & SMITH (G. Pugh). **Growth Stimulation of Blow-fly Larvae fed on fatigued Frog Muscle.**—*J. Exp. Biol.*, x, no. 2, pp. 196–200, 1 graph, 4 refs. London, April 1933.

Larvae of *Calliphora erythrocephala*, Mg., were fed on resting and on fatigued frog muscle (the latter obtained by stimulating electrically the sciatic nerve of an amputated leg), reared in the dark at 23°C. [73·4°F.] and weighed daily. Those fed on fatigued muscle attained a weight 9 per cent. greater than those fed on resting muscle, and the rate of their heart beat was increased by 14 per cent. The length of larval life and the oxygen consumption was the same in both sets of larvae.

KEMPER (H.). **Zur Frage: Wie findet die Bettwanze den Weg zu ihrem Opfer.** [On the Question how the Bed-bug finds its Host.]—*Z. GesundhTech. u. Städtehyg.*, xxiv, no. 7–12, pp. 379–380. Dresden, 1932. [Recd. March 1933.]

Commenting on Rivnay's experiments [*R.A.E.*, B, xviii, 223; xix, 93; xx, 139] the author considers that heat radiated by a warm-blooded animal cannot attract *Cimex lectularius*, L., from a distance, and that the bug either finds a host by chance or is guided by memory to return to a place previously occupied.

WILHELMI (J.). **Kommunale Stechmückenbekämpfung unter Mitwirkung der Tiefbauämter.** [Communal Measures against Mosquitos with the Co-operation of Offices of Underground Works.]—*Z. GesundhTech. u. Städtehyg.*, xxv, no. 1, pp. 55–64. Berlin, January 1933.

Campaigns against mosquitos are being carried out in many towns and districts in Germany, and in this article an outline is given of the preparatory investigations and the actual measures required, including the organisation of the work.

Henkel (H.). **Falsche Massnahmen zur Stechmückenbekämpfung.** [Wrong Measures against Mosquitos.]—*Z. GesundhTech. u. Städtehyg.*, xxv, no. 2, pp. 111–118. Berlin, February 1933.

For several years a town in Germany has suffered from a summer plague of mosquitos in spite of careful oiling of stagnant waters, covering of water-butts, and spraying in cellars. Investigation showed, however, that the species responsible for the trouble is *Aëdes vexans*, Mg., which appeared in huge swarms in June 1932 and against which the measures taken are useless. This mosquito hibernates in the egg-stage and in this area has one generation a year. The eggs are laid on grass, etc., in land subject to flooding and hatch when the water rises. The breeding-places should be flooded artificially in October, when the larvae will hatch and be destroyed by cold in winter.

Japha (A.) & Osterwald (H.). **Erfahrungen der Stadt Halle in der Stechmückenbekämpfung.** [The Experience of the Town of Halle in the Control of Mosquitos.]—*Z. GesundhTech. u. Städtehyg.*, xxv, no. 4, pp. 217–232, 3 figs., 9 refs. Berlin, April 1933.

This is a survey of investigations on the breeding-places and control of mosquitos carried out in and near the town of Halle in Saxony for several years. Serious annoyance was caused by species of *Culex*, *Theobaldia* and *Aëdes*, whereas the Anophelines, of which *Anopheles maculipennis*, Mg., was very common, were not troublesome, being almost entirely limited to animal quarters as a result of improvements in agricultural and living conditions generally [*R.A.E.*, B, ix, 68; x, 6]. Both *Culex* and *Theobaldia* chiefly occurred in the town and its suburbs, where favourable conditions for breeding were provided by water-butts and especially by sludge traps; the number of these breeding-places has greatly increased within the last few years, and as a result, *C. pipiens*, L., has become a domestic species, readily attacking man. The species of *Aëdes* were most troublesome on an island on the river Saale that is flooded every spring. *A. punctor*, Kby. (*meigenanus*, Dyar) caused serious annoyance in a pine forest on the side of the river opposite the town.

Observations on the hibernation of *Culex* showed that damp, deep cellars were preferred, as were those on the northern side of houses. Heated cellars were free from infestation. Though the mosquitos preferred dark places for hibernation, they became positively heliotropic during the winter if the cellar was sufficiently warm, and congregated near the windows. During the extremely severe winter of 1928–29, some of the mosquitos in cellars were found frozen to death and covered with a thick layer of hoar-frost, which indicates that they could not hibernate in the open.

Aëdes larvae proved to be very resistant to cold and survived in waters that became completely covered with ice for five days in April. Eggs in *Sphagnum*, taken in winter from the bottom of a dry breeding place, hatched in less than an hour when placed in water [*cf.* xxi, 5]; this explains the rapid appearance of the great numbers of larvae following floods in spring. In the laboratory, all the immature stages occurred simultaneously in the same container, and as soon as fresh water was added and the decomposing débris turned over, more of the young larvae appeared, which shows the importance for control of using larvicides that remain on the water for a long time.

The destruction of *Culex* larvae was made compulsory by police regulations. Sludge traps in which larvae were found were treated with waste oil, and the hibernating adults were destroyed by sprays. As a result, no annoyance was caused by mosquitos in the summer of 1931, but owing to the discontinuance of these measures, they reappeared in swarms in the following year.

FRITSCH (W.). **Massenauftreten von Chloropiden.** [A Mass Occurrence of Chloropids.]—*Anz. Schädlingsk.*, ix, no. 4, p. 59. Berlin, April 1933.

In September 1932 a house in Insterburg, Prussia, was infested by such swarms of *Chlorops hypostigma*, Mg., that the windows were completely obscured and the rooms had to be vacated. It is estimated that 27–29 million flies were present. The author states that records show that such infestations occur in houses that are covered with creepers.

VAUCEL (M.) & SALEUN (G.). **Le paludisme à Brazzaville.**—*Bull. Soc. Path. exot.*, xxvi, no. 1, pp. 18–23, 1 ref. Paris, 1933.

The number of malaria cases among Europeans at Brazzaville was very much higher between October 1931 and October 1932 than it had been in previous years. The Anophelines taken were almost exclusively *Anopheles gambiae*, Giles (*costalis*, Theo.), with the exception of a few individuals of *A. marshalli*, Theo., and the increase in the incidence of the disease was probably the result of the creation of artificial breeding-places for the former in the course of important constructional works being carried out at that time [*cf. R.A.E.*, B, xvii, 82].

GASCHEN (H.). **Sur la présence de** *Xenopsylla brasiliensis* **et** *Xenopsylla astia* **sur les rongeurs domestiques de la région de Dakar.**—*Bull. Soc. Path. exot.*, xxvi, no. 1, pp. 25–27, 10 refs. Paris, 1933.

A batch of 720 fleas collected from rats in the region of Dakar during July comprised *Xenopsylla cheopis*, Roths. (64·2 per cent.), *Echidnophaga gallinacea*, Westw. (17·5), *X. astia*, Roths. (12·2), *Synosternus pallidus*, Tasch. (0·3), *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch., and *C.* (*C.*) *canis*, Curt. (0·3), and *X. brasiliensis*, Baker, which has not previously been recorded from Senegal (5·5).

ROUBAUD (E.), COLAS-BELCOUR (J.) & GASCHEN (H.). **Etude du comportement sexuel comme caractère génétique, chez l'***Anopheles maculipennis*.—*Bull. Soc. Path. exot.*, xxvi, no. 1, pp. 27–29, 4 refs. Paris, 1933.

In experiments in which females of the large eurygamic race of *Anopheles maculipennis*, Mg. [*cf. R.A.E.*, B, xx, 213] paired with males of a stenogamic race from Normandy, the progeny were stenogamic, showing that this character is a Mendelian dominant. The recessive (eurygamic) character reappeared in the second generation.

MORIN (H. G. S.) & TOUMANOFF (C.). **Sur le rôle de** *Anopheles maculatus* **dans la transmission du paludisme au Tonkin.**—*Bull. Soc. Path. exot.*, xxvi, no. 1, pp. 83–92, 1 fig. Paris, 1933.

The authors discuss at some length the part played by *Anopheles maculatus*, Theo., in the transmission of malaria in Indo-China, where

its distribution does not always coincide with that of the disease. Of the mosquitos taken in houses in Tonkin during the day from January 1931 to April 1932, *A. minimus*, Theo., was about 19 times as numerous as *A. jeyporiensis*, James, and over 33 times as numerous as *A. maculatus*. On the other hand, dissection showed 2 out of 45 individuals of *A. maculatus* to be infected as compared with only 26 out of 1,001 *A. minimus* and 3 out of 75 *A. jeyporiensis*. It is therefore assumed that even in localities where it is an effective vector, it rests during the day in shelters in the vicinity of houses, as other Anophelines have been found to do. Thus the theory that it is only the house-haunting Anophelines that are dangerous is not always true. The difficulty experienced throughout Indo-China in collecting *A. maculatus* in houses during the day renders it impossible to draw any definite conclusions as to the part it plays in the transmission of malaria. It readily attacks human beings, but the closeness of its relations with man appears to be affected by local conditions. The necessity for detailed local investigations to determine the vector and consequently the most economical measures of control is again emphasised [*cf. R.A.E.*, B, xx, 72].

Memoria de la campaña contra el paludismo (1930–1931). [Report on the Campaign in Spain against Malaria, 1930–31.]—Med. 8vo, xvii+341 pp., ill. Madrid: Direcc. gen. Sanidad, 1932. [Recd. March 1933.]

The information in this report is divided according to districts and includes records of the species of mosquitos and *Phlebotomus* found. These local records are collated in a concluding chapter. There is a short survey (pp. 322–327) by J. Gil Collado of the entomological data, most of which have already been noticed [*R.A.E.*, B, xix, 103, 161, 253; xx, 78].

Pittaluga (G.) et al. **Le paludisme dans les "deltas." (Etudes sur certaines conditions naturelles et expérimentales de l'anophélisme dans le delta de l'Ebre, 1926–1930.)**—*Arch. roum. Path. exp. Microbiol.*, v, no. 1, pp. 5–131, 5 pls., 29 figs., 17 graphs, 21 refs. Paris, March 1932.

A detailed account is given of investigations carried out from 1926 to 1930 in the delta region of the river Ebro in Spain, where malaria was very severe about 15 years ago though its incidence has since decreased considerably. The topography, climate and population are discussed, together with observations on the mosquitos and their breeding-places, with particular reference to *Anopheles maculipennis*, Mg., the only Anopheline collected.

The experimental work, which consisted chiefly in determining the relative numbers of mosquitos taken at all seasons of the year in huts erected at different places, is dealt with at some length, and the following is taken from the discussion and conclusions: The preference of *A. maculipennis* for mammalian blood is demonstrated by the low percentage of females containing avian blood in spite of the abundance of large wild birds in the delta, and conversely by the high percentage containing mammalian blood despite the small numbers of domestic animals. Moreover, the numbers of females in experimental huts containing rabbits were always higher than in those containing fowls, and the presence in huts containing fowls of females engorged with mammalian blood indicated that these situations were being utilised

as shelters by individuals that had fed elsewhere. Such observations, together with the paucity of species of Culicines, suggest that the introduction of mosquitos into the delta is comparatively recent and is associated with the advent of man and the development of agriculture. In the lower, uninhabited part of the delta, 60 per cent. of the Anophelines were of the typical form, whereas in the cultivated part in the vicinity of the village of La Cava, *A. maculipennis* var. *atroparvus*, van Thiel, predominated. Of 5,349 females of *A. maculipennis* examined between September and December 1926 only 6·08 per cent. contained human blood, whereas 83·5 per cent. contained the blood of other mammals and 9 per cent. the blood of birds. It is not known whether *A. maculipennis* var. *atroparvus* is the primary biological type and what is considered the typical form the adaptation to animals, or whether the latter is the primary type, in which the marked zoophilism may have originally been connected with birds. The authors are under the impression, however, that no Anopheline is naturally completely dissociated from man.

When the mosquitos are dispersed, that is, during the summer generations, the source of food may be a considerable distance from their shelters or breeding-places. Thus, in a region such as the delta, with a scattered population, large water surfaces and no obstacles to flight or the influence of wind, the successive generations maintain very distant relations with their sources of origin. They are constantly moving from place to place and varying their contact with man, domestic animals, shelters, breeding-places, etc. These phenomena are unfavourable for the fixation of characters, either biological (zoophily, preference for domestic waters for oviposition, etc.) or morphological. On the other hand, females of the hibernating generations congregate in shelters where suitable food is available.

From observations on the proportions of the sexes, it appears that the numbers of males in a shelter is not always inversely proportionate to the distance from breeding-places [*cf.* *R.A.E.*, B, xvi, 177, etc.]. Evidence is also given that males prefer more airy shelters with lower temperatures and will travel to those farther from their breeding-places if the nearer ones are not favourable.

There appear to be three or four generations a year in the delta, but the annual numbers of Anophelines produced vary greatly. It is usual to attribute such variations to the amount of rainfall, but in the delta region the rainfall has little influence on the amount of irrigation water available for breeding. It has been suggested that an abundance of larvae brings about an increase in the larviphagous fauna of the breeding-places that results in the progressive diminution of adults in the succeeding generations. Owing to the consequent reduction in the numbers of hibernating adults there are fewer larvae in the following year and the larviphagous fauna is reduced through lack of nourishment, so that the larvae survive in large numbers and the adults again appear in abundance. Observations in connection with this hypothesis have not been sufficiently numerous to confirm it. There is, however, no doubt that the temperature at the time of the dispersal of the hibernating females has an important influence on these variations. A delay in the occurrence of temperatures suitable for the reactivation of asthenic females is an important factor in prolonging the hatching period of the eggs. This temperature is not high [*cf.* xx, 78], but if the temperature oscillates excessively, females in which the fat-body is insufficient will die. A certain regularity in the spring variations of

temperature is required to prepare the females for oviposition. While the minimum temperature remains below 6–8°C. [42·8–46·4°F.], as it does in January, February and half March, the females do not emerge from hibernation, and oviposition and larval development are delayed. The minimum temperatures exercise a still greater influence if they remain low (less than 12°C. [53·6°F.]) during April and May, for hatching and larval and pupal development are prolonged and the emergence of the adults does not occur for 30–40 days or more. It is evident that the longer the periods of development, the more liable the larvae are to be destroyed by the larviphagous fauna.

The mobility of the mosquitos is greatest at the times of concentration and dispersion of the females before and after hibernation, which correspond to periods during which a sufficient humidity is associated with favourable temperatures. Wind is shown to be a factor in dispersal, since more mosquitos were caught in experimental huts at times when the wind was blowing from breeding-places. A high wind may, however, be unfavourable if it is too strong to allow the mosquitos to stop in order to enter the huts.

ZOTTA (G.). **Etudes sur le paludisme dans le delta du Danube. (I. anophélisme sans paludisme.)**—*Arch. roum. Path. exp. Microbiol.*, v, no. 1, pp. 133–176, 1 map, 3 refs. Paris, March 1932.

A detailed account is given of the topography of, and the incidence of malaria in, the valley of the Pruth and the lower valley and the delta of the Danube. In the two valleys, the malaria index is high, whereas in the delta region it is very low; in 1926, the splenic indices were 19·06, 17·7 and 4·6 per cent. respectively. Since 1923, when regular quinine administration was begun, the frequency of cases and the malignancy of the disease have diminished considerably, but the figures for the delta still remain lower than those for the other localities. On the other hand, Anophelines are very abundant in this region. The presence of *Anopheles maculipennis*, Mg., appears to be closely associated with man; it is always abundant in populated localities but becomes progressively more scarce the greater the distance from human habitations until, in certain isolated areas, it was often impossible to find. It appears, however, to prefer animal shelters to inhabited houses, in which it is often replaced by *A. hyrcanus* var. *pseudopictus*, Grassi. The author does not consider that zootropism of the Anophelines explains the low incidence of malaria, particularly as it has yet to be shown that this phenomenon is constant in excessively dry years when the cattle wander for great distances without returning to the villages. Although cases of malaria in the upper part of the delta might be attributed to infection from outside, cases occurring in the central and lower parts, which are isolated and considered to be free from the disease, must have been contracted on the spot. On the other hand, no epidemics result. Immunity of the population cannot be considered as the explanation or a similar situation would exist in such places as the valley of the Pruth. It is possible, however, that the economic status of the population may have a bearing on its resistance to infection. Thus the agricultural population of the Pruth Valley is often insufficiently nourished owing to the effect of drought on the crops, whereas the fish that form the staple diet of the people of the delta are not affected by climatic conditions and the population is in an excellent state of health.

Massa Sassi (M.). **Contributo al estudio del Anophelismo en Chile.** [A Contribution to the Study of Anophelism in Chile.]—*Rev. Inst. bact. Chile,* ii, no. 1, pp. 27–38, 10 figs. Santiago, 1931. [Recd. April 1933.]

Anopheles (*Nyssorhynchus*) *pictipennis*, Philippi, was bred from larvae collected at Quilpué, Chile. Both adults and larvae are described.

Macchiavello Varas (A.). **Ensayo sobre clasificacion de las pulgas de los roedores del puerto de Antofagasta.** [An Essay on the Classification of the Fleas of Rats and Mice of the Port of Antofagasta.]—*Rev. Inst. bact. Chile,* ii, no. 2, pp. 1–43, 7 graphs, 2 pp. refs. Santiago, 1931. [Recd. April 1933.]

Information, largely from the literature, is given on the classification of the fleas taken from rats and mice in the port of Antofagasta, Chile, with a report of the author's investigations there [*R.A.E.*, B, xxi, 105].

Massa Sassi (M.). **El *Trypanosoma cruzi* en los alrededores de Melipilla.** [*T. cruzi* in the Neighbourhood of Melipilla.]—*Rev. Inst. bact. Chile,* ii, no. 2, pp. 87–89, 1 fig. Santiago, 1931. [Recd. April 1933.]

Examples of *Triatoma infestans*, Klug, collected in May 1930 near Melipilla, Chile, contained developmental forms of trypanosomes that corresponded to those of *Trypanosoma cruzi* and produced trypanosomiasis when injected into laboratory animals.

Macchiavello Varas (A.). **Estudio sobre las ratas del puerto de Antofagasta en relacion con las epidemias de peste bubonica.** [A Study of the Rats and Mice of the Port of Antofagasta in Connection with the Epidemics of Bubonic Plague.]—*Rev. Inst. bact. Chile,* iii, no. 1, pp. 39–72. Santiago, 1932. [Recd. April 1933.]

In this survey of the rats and mice in the port of Antofagasta, Chile [*cf. R.A.E.*, B, xxi, 105], attention is drawn to the fact that though most of the fleas on *Mus musculus* were *Leptopsylla segnis*, Schönh. (*musculi*, Dug.), the index of *Xenopsylla cheopis*, Roths., on it was 2·1. This is of interest as mice have always been considered of little importance in relation to plague on the ground that their fleas are few in number and almost always *L. segnis*, which does not bite man or transmit the disease.

Fréville (—). **Contribution à l'Epidémiologie de la Peste en Cochinchine.**—*Ann. Méd. Pharm. colon.*, xxx, no. 4, pp. 653–679. Paris, 1932. [Recd. April 1933.]

Plague appears to have been introduced into Cochin China by sea in 1906, and continued to spread till 1920. Since then it has steadily decreased, and in 1931 only 3 cases were recorded. The predominant form is bubonic. The controlling factors in this decrease are probably zoological and climatic, fleas being rare and the rate of infection in rats extremely low, so that the prophylactic measures adopted were able to produce a maximum effect. The small mammals concerned are *Mus norwegicus* (*decumanus*) (60–80 per cent.), *M. rattus* (15–20), and shrews

[*Crociura*] (5–10). Observations showed an index of 0·8 for *Xenopsylla cheopis*, Roths., and 0·08 for *X. astia*, Roths. In Cambodia, where *M. rattus* is commoner (40 per cent.), a few counts showed a much higher flea-index. These figures are compared with results from Madagascar [*R.A.E.*, B, xiv, 23 ; xx, 148] and British India [xx, 27].

DUKE (H. L.). **The Domestic Fowl of Uganda as a Host for Trypanosomes of the *brucei* Group.**—*Parasitology*, xxv, no. 2, pp. 171–191, 22 refs. Cambridge, 14th April 1933.

Fowls have been used in Uganda since 1926 as a supposedly non-infective food-supply for *Glossina* in experiments in the transmission of *Trypanosoma brucei* and *T. rhodesiense.* In view of the discovery that fowls could be infected by inoculation with *T. rhodesiense* [*R.A.E.*, B, xix, 232], investigations were made to determine whether the Uganda fowl could receive or impart infection with *T. rhodesiense* or *T. brucei* by the bites of tsetse. The regularity of the results obtained in the other experiments was strong presumptive evidence that they had not been vitiated by infection of the flies from this source.

Of 17 fowls bitten by flies (*Glossina palpalis*, R.-D., and *G. morsitans*, Westw.) carrying heavy gland infections of *T. rhodesiense* (5 different strains recently isolated from man), only 4 gave any evidence of being infected ; of 12 exposed to the Kazinga strain of *T. brucei* only one became infected. Two exposed to the Damba trypanosome [xx, 222] were not infected. Of more than 1,300 clean flies fed on the infected fowls, none were infected with *T. brucei* and only 5 *G. palpalis* with *T. rhodesiense*. Two of these showed normal heavy gut-infection ; in the others the infection was extremely slight and probably abortive. The nature of this very slight gut-infection is discussed [xiii, 41]. The two heavily infected flies had fed on a fowl shortly after its exposure, which suggests that fowls can infect *G. palpalis*, if at all, only during the early stages of infection. The author concludes that it is very unlikely that the fowl need be regarded as a factor in the spread of sleeping sickness in nature, at all events in the *G. palpalis* regions.

MACLEOD (J.) & GORDON (W. S.). **Studies in Tick-borne Fever of Sheep I. Transmission by the Tick *Ixodes ricinus*, with a Description of the Disease produced.**—*Parasitology*, xxv, no. 2, pp. 273–283, 4 charts, 5 refs. Cambridge, 14th April 1933.

In further investigations of " tick-borne fever " of sheep in Scotland [*R.A.E.*, B, xx, 206, 266 ; xxi, 58], it was found that the causal agent was transmitted by the bites of adult females and nymphs of *Ixodes ricinus*, L. Two females were enough to produce infection. Larvae bred from females fed on infected sheep failed to transmit the disease, and in a limited number of experiments it was not produced by inoculation with emulsions of presumably infective ticks. The incubation period of the fever lasted 3–13 days and was apparently shorter after infestation by nymphs (usually 4–6 days) than by adult females (usually 7–8 days). It was followed by a febrile reaction lasting 6–22 days, the highest temperature (106–108°F.) generally being reached on the second day. After the reaction had subsided, the blood was infective for at least 35 days, but not after 70 days. A slight reaction was produced in goats by the bites of infected nymphs and by inoculation with infective blood.

Mortality as a direct result of infection was rare, but there was evidence to suggest that tick-borne fever may predispose affected animals to die from secondary causes. Normally dullness and loss of weight are the only clinical symptoms, but the disease is probably so widespread as to have considerable economic importance.

Economic Advisory Council. **Tsetse Fly Committee Report. Developments in the Treatment of Animal and Human Trypanosomiasis and in Tsetse Fly Control in the Period 1925–31.**—Med. 8vo, 27 pp. London, H.M.S.O., 1933. Price 6*d*.

The advance that has been made during the period 1925–1931 in investigations in Africa on trypanosomiasis in man and animals and on the control of tsetse-flies is reviewed. The section on *Glossina* deals briefly with such measures as reclamation by means of clearing and settlement and by means of organised grass burning; the division of fly belts by means of strip clearings into blocks that can be dealt with individually; the prevention of re-infestation by means of game barriers of living trees, and of fly barriers of dense thicket created either by planting or by protecting strips of actual or potential bush land from grass fires; and the wholesale catching of the fly by hand nets or traps. A brief account is given of the progress made in Tanganyika Territory and Nigeria.

Duke (H. L.). **Annual Report of the Human Trypanosomiasis Research Institute for the Year ended 31st December 1932.**—Fol., 10 pp. Entebbe, 1933. Price 1*s*.

Much of the information mentioned in this report on the work of the Institute at Entebbe has already been noticed [*R.A.E.*, B, xx, 222; xxi, 53, 127] or will form the subject matter of future papers. So far no strain of *Trypanosoma brucei* or *T. rhodesiense* freshly isolated from *Glossina morsitans*, Westw., or *G. pallidipes*, Aust., has been found to be non-transmissible by the local *G. palpalis*, R.-D. A single strain of each of these trypanosomes, obtained from a *G. morsitans* fly belt, has been maintained by cyclical passage for a number of generations and up to the present no change in their virulence is apparent. Of 738 individuals of *G. morsitans* collected at Murchison Falls, 3·8 per cent. were found to be infected with *T. grayi*. This is the first record of *T. grayi* from this species of fly, which is therefore capable of feeding on reptiles (in this case crocodiles) in nature. During the year several instances of unilateral infection of the salivary glands with either *T. rhodesiense* or *T. brucei* were observed in both *G. morsitans* and *G. palpalis*.

Beeuwkes (H.), Kerr (J. A.), Weathersbee (A. A.) & Taylor (A. W.). **Observations on the Bionomics and Comparative Prevalence of the Vectors of Yellow Fever and other Domestic Mosquitoes of West Africa, and the Epidemiological Significance of Seasonal Variations.** —*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 5, pp. 425–447, 5 figs., 5 refs. London, 23rd March 1933.

Comparative surveys of the factors bearing on yellow fever infection were carried out in 1930–32 in two cities (Lagos and Ibadan) of Southern Nigeria, where yellow fever is endemic, and two cities (Kano

and Zaria) and one native village of Northern Nigeria, a region where epidemics have recently been reported. Records of the numbers and contents of water-containers in or about houses, which were actual or potential breeding-places of *Aëdes aegypti*, L., and also of the adult mosquitos found in each room of the houses selected, are discussed in relation to climatic and other conditions. The climate of Southern Nigeria is marked by a high annual rainfall, a constantly high relative humidity (mostly over 80 per cent.) and small fluctuations in the mean monthly temperature (70–90°F.). In Northern Nigeria the rainy season (June-September) alternates with a rainless season, marked by a dry north-east wind (harmattan), a mean relative humidity sometimes below 30 per cent. and great daily variations in temperature. In Lagos the house and container indices for larvae of *A. aegypti*, and the numbers of adults per hundred rooms (13 in October-December and 31 in June) were much lower than in Ibadan (140–180), probably owing to better sanitation. In the two northern cities, though the house and container indices were not much lower than in Ibadan, the numbers of adults were far smaller (25–50 and 30–80), showing that their life is relatively short. In the native village the July figure for adults was 800, but this dropped to 50 in April. Though there is no absolute criterion as to the *Aëdes* index necessary to maintain infection permanently in any locality, it appears that unfavourable conditions during the harmattan season prevent its becoming endemic in the North, where the first serious epidemics recorded (in 1931) coincided with a failure of the harmattan during the early months.

Records of mosquitos other than *A. aegypti* show that in Lagos *Culex* was particularly abundant and *Anopheles* extremely rare. Of the species that have been found experimentally to be potential vectors of yellow fever [*R.A.E.*, B, xvi, 225 ; xvii, 213 ; xviii, 147, 198 ; xx, 221], practically no examples were found in houses, except that *Mansonia africana*, Theo., was sometimes not infrequent in the North, 105 per 100 rooms being recorded at Kano in October, so that it may play some part in the seasonal epidemics.

Laboratory experiments were conducted at Yaba (S. Nigeria) and Gadau (N. Nigeria) on the longevity of adults of *Aëdes aegypti*, under conditions probably rather more favourable than the natural ones. At Yaba the average length of life was 40–61 days for males and 70–116 for females, with maxima of 82–135 and 131–225. Practically no seasonal variation was observed. At Gadau under normal room conditions the averages were 10–43 and 22–65, and the maxima 26–75 and 45–109 ; in an artificially moist chamber these periods were prolonged to 29–46, 61–91, 49–86 and 116–189. The Yaba strain of *A. aegypti* was found to resist normal conditions at Gadau as well as the native strain. Normal longevity was appreciably greater in the season of high humidity and moderate temperature, approaching more nearly to the regular climate of Southern Nigeria. The variations appeared to be more closely correlated with temperature than with humidity ; thus in the cold-dry season mosquitos lived no longer at 60 per cent. humidity than at the natural humidity of 30.

HARGREAVES (H.). **Annual Report of the Government Entomologist. Medical.**—*Ann. Rep. Dept. Agric. Uganda 1931*, pt. ii, pp. 47–58. Entebbe, 1932. [Recd. April 1933.]

The results are given of Anopheline surveys conducted in 1931 in Uganda at Arua, at Fort Portal [*R.A.E.*, B, xx, 278], at Lira, Soroti and

Tororo in the Eastern Province, and at Serere. Work at Kampala [*cf.* xix, 190] was restricted to collection of larvae to check the results of control measures. At Arua, larvae of *Anopheles maculipalpis*, Giles, which is known to transmit malaria experimentally, were abundant, but the adults were not found in dwellings, in which the commonest species was *A. funestus*, Giles, *A. gambiae*, Giles, being rare, especially in European houses. In the Eastern Province areas, surveyed in May-July, *A. gambiae* was commoner than *A. funestus*, but this may be only seasonal. The chief breeding-places were temporary marshes, which are more favourable than permanent swamps, as the latter tend to become foul or flocculent. Observations confirmed the finding [xvii, 249] that *A. gambiae* enters houses in the mornings. At Serere in January, *A. funestus* only was found in houses, though at the nearest discoverable breeding-place, *A. gambiae* also was present in vast numbers.

In surveys of the swampy forests near Kampala, the only Anophelines found breeding under heavy shade were *A. obscurus*, Grünb., and *A. implexus*, Theo., neither of which is a known vector of malaria. The imperfect success of the afforestation of Lugogo swamp with *Eucalyptus* shows that temporary drainage is needed to establish these trees. An examination at Kampala of tanks, gutters, barrels and tree-holes revealed no Anophelines, but larvae of *Aëdes aegypti*, L. (*argenteus*, Poir.) were abundant. Anophelines not previously recorded from Uganda included *Anopheles ardensis*, Theo., *A. christyi*, Newst. & Cart., *A. distinctus*, Newst. & Cart., *A. multicinctus*, Edw., and *A. pretoriensis*, Theo., none of which is likely to be seriously concerned in malaria transmission.

Certain mosquitos from Kenya Colony were identified, *viz.*, *Culex mirificus*, Edw., which was believed to be very rare, but has been found breeding in enormous numbers in Nakuru Lake and constituting a serious nuisance, and *Mansonia fuscopennatus*, Theo., *M. versicolor*, Edw., and a third species, all of the sub-genus *Coquillettidia*, which are thought to be concerned in the transmission of a virus disease of sheep [*cf.* xix, 208].

Of 206 examples of *Mus* (*Rattus*) *rattus* trapped at Kampala, 35 per cent. were infested with fleas, of which 305 were *Xenopsylla cheopis*, Roths., and 35 *X. brasiliensis*, Baker, 11 belonging to other species, whereas of 573 field rodents, of which the commonest was *Arvicanthis abyssinicus*, only 8 per cent. were infested, chiefly with *Dinopsyllus lypusus*, J. & R. (51), and rarely with *X. cheopis* (11) or *X. brasiliensis* (2), suggesting that contact between one species of rodent and another is small.

GIBBINS (E. G.). **The Domestic *Anopheles* Mosquitoes of Uganda.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 15–25, 10 refs. Liverpool, 10th April 1933.

In the course of a malaria infectivity survey carried out in four different localities in Uganda over a period of approximately four years [*R.A.E.*, B, xx, 278], detailed records were kept of the prevalence and infection of *Anopheles* in individual dwellings, which were searched twice weekly for mosquitos. Most of the individuals of *A. gambiae*, Giles (*costalis*, Theo.) and *A. funestus*, Giles, captured in native huts were taken on the upper portion of the walls and the lower parts of the roof in the darkest places. Few were found on the ground except in the vicinity of beds that had recently been slept in. There was a tendency for

males to congregate and rest within small areas. The majority of individuals of *A. coustani* (*mauritianus*) var. *ziemanni*, Grünb., were taken near the ground, such objects as tins and bottles standing on the ground being favoured resting-places. The suggestion that the presence or absence of males among catches of mosquitos may indicate whether breeding-places exist at that time could only apply in Uganda to *A. gambiae* and *A. funestus*, since males of the other four malaria-carrying species, *A. theileri* var. *hancocki*, Edw., *A. moucheti*, Evans, *A. pharoensis*, Theo., and *A. marshalli*, Theo., as well as of *A. coustani* var. *ziemanni* and *A. transvaalensis*, Cart., were scarce or absent in houses. Monthly collections of *A. gambiae* and *A. funestus* for a period of 11 months did not show any relationship between the numbers of the sexes. The prevalence of males in native huts was also independent of their distance from breeding-places. In Uganda, sex prevalence in these two species appears to be largely a question of light, a higher proportion of males being found in the lighted dwellings of Europeans. No appreciable difference in the prevalence or infectivity of *A. gambiae* or *A. funestus* was found in huts containing human beings only and in those which also contained fowls and goats, thus confirming Symes' observations [xviii, 199; xx, 262] that man is preferred, particularly as most of the Anophelines were captured in the inner rooms used by human beings. There is no doubt that the presence of domestic animals plays an important part in determining the house-frequenting habit of *A. coustani* var. *ziemanni*. Garnham [xvii, 249] found that *A. gambiae* and *A. funestus* avoided houses where fires were maintained, but the author's observations at Kampala confirm those of Symes [xviii, 199] that the presence of smoke due to cooking fires within a native hut does not prevent the occurrence of these two species. All the huts under consideration had a separate apartment for sleeping or the bed was curtained off, so that mosquitos were able to find a place less impregnated with smoke than the rest of the hut. Dense vegetation near a hut greatly increased the numbers of mosquitos in it.

DAVEY (T. H.) & GORDON (R. M.). **The Estimation of the Density of Infective Anophelines as a Method of Calculating the relative Risk of Inoculation with Malaria from different Species or in different Localities.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 27–52, 9 refs. Liverpool, 10th April 1933.

The authors describe a method for use in interpreting the results of Anopheline surveys of houses in which the Anopheline density and sporozoite infection rate are combined to give the average number of infective Anophelines per room per night (infective density). As the number of Anophelines entering rooms varies in the same district, it is necessary to take samples from different houses at different seasons of the year. The samples are obtained in the early mornings, and in order to calculate the number of females that were present in the houses during the night, it may be necessary to increase the figure by adding an estimated amount (expressed in the formula by "x") representing the numbers that had left the houses before examination. The Anopheline density is, therefore, the number of female Anophelines captured plus "x," divided by the number of rooms examined. The infective ratio is the number of females with sporozoites divided by the number dissected. The infective density is then obtained by multiplying the Anopheline density by the infective ratio. If "x"

is known, the infective densities of localities in different parts of the world can be compared, so long as the species transmitting malaria bite indoors. If, however, the Anophelines, whether of one or more species, behave similarly as regards the period of time they remain in the house after a blood meal, the term "x" need not be considered, as it is common to both infective densities. *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. funestus*, Giles, appear to be essentially house-haunting species of the same habits, so that in comparing infective densities in West Africa, "x" need not be considered.

Applying the formula to data obtained during a recent survey of Kissy [*R.A.E.*, B, xx, 279] in which the Anopheline density per room was 2·8 for *A. gambiae* and 3·3 for *A. funestus* and the infective ratio 0·111 and 0·041 respectively, the infective density of *A. gambiae* was 0·311 and of *A. funestus* 0·135. As these are the only Anophelines occurring in significant numbers, *A. gambiae* is responsible for some 70 per cent. of the malaria transmission and *A. funestus* for about 30 per cent. In Freetown systematic anti-Anopheline measures have been carried out on a gradually increasing scale for the past 30 years, whereas the neighbouring native village of Kissy differs but little from any other village in the Colony. Infective densities taken from wet season data [*loc. cit.*] were 0·0242 and 0·844 respectively. Thus the infective density in Kissy is 34 times as great as in Freetown, and this fact is a concise expression of the results of prolonged anti-mosquito measures. Calculated from data obtained during a recent survey by Barber and Olinger [xx, 64], the infective densities of Lagos and its environs and of Ibadan for the same time of year and including all Anophelines are 0·403 and 0·098 respectively. A graph of the infective densities in Kissy, for all species, for *A. gambiae* and for *A. funestus* shows a striking seasonal difference, the average for all species being 0·075 in the dry season and 0·84 in the rainy season. *A. gambiae* was almost entirely responsible for maintaining the infective density throughout the year. *A. funestus* only markedly affected the general infective density during July, August and September and then only showed a maximum of 0·8 despite the fact that in August, September and October it was three times as numerous as *A. gambiae*.

Infective density may be defined as the number of sporozoite inoculations awaiting distribution in each room each night, and the authors define the inoculation rate as the number of sporozoite inoculations distributed. As only a proportion of the Anophelines bite on any one night the inoculation rate is a fraction of the infective density, which it should be possible to estimate, although the fact that there may be more than one bite for each infective Anopheline due to interrupted feeding must also be taken into account.

In spite of the fact that the infective densities in Freetown and Kissy were in the proportion of 1 : 30, examination of school children showed infection rates of 81 and 92 per cent. It is believed that this lack of correlation is due to the large number of relapses common to both districts. For this reason investigations were undertaken during the most malarious months of the year among infants exposed to infection for the first time. In Kissy, with an infective density of 1·29, 52 per cent. were infected, whereas in Freetown the corresponding figures were 0·031 and 5. With advancing age, this great difference steadily diminishes.

The view has been expressed that as native children will eventually acquire the disease, little is gained by anti-Anopheline measures,

which merely have the effect of postponing the primary attack, but the authors point out that as it is probable that a primary attack during the first few months of life is more dangerous, the infant mortality must therefore be reduced. Moreover, in the case of Europeans in a locality with a low infective density, malaria may be warded off indefinitely by means of personal prophylaxis.

DE MEILLON (B.). **On *Anopheles funestus* and its Allies in the Transvaal.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 83–97, 8 figs., 3 graphs, 4 refs. Liverpool, 10th April 1933.

The success of the principle of " species sanitation " advocated by Swellengrebel [*R.A.E.*, B, xx, 75] depends on accurate identification of the mosquitos concerned in malaria transmission. *Anopheles funestus*, Giles, one of the principal vectors in South Africa, is difficult to distinguish in both the adult and larval stages (especially since the recent discovery of a closely allied form, subsp. *leesoni*, Evans [xx, 68] in Southern Rhodesia, Natal and the Transvaal), and the author therefore gives notes on characters that distinguish the adult and larva from those of *leesoni* and closely allied species with a key to the larvae. Weekly collections of larvae of *A. funestus* and subsp. *leesoni* in all types of breeding-places were made during 11 months at two localities in the Transvaal 12 miles apart. It was found that in one locality both forms disappear in September, whereas in the other the minimum number occurs in June and breeding never really ceases. This extraordinary change in habit appears to be due to differences in the climatic conditions. In the first locality the adults enter dwellings much less readily than in the second, and it is suggested that the race inhabiting the former will be found to be largely zoophilic and in the latter largely anthropophilic, and race sanitation may possibly be substituted for species sanitation. Thus, when contemplating malaria control measures in a given area, it is necessary to determine the species present in dwellings, and consequently to be able to identify adults of *A. funestus*. It is assumed here that the vector of malaria is always a house-haunter, experience having so far shown that the infectivity among species that do not frequent houses is negligible in parts of South Africa where detailed investigations have been made The adult females of *A. funestus* and subsp. *leesoni* cannot be distinguished, but males of the former have two and of the latter three pale markings on the palp. It is thus impossible to estimate directly the relation of subsp. *leesoni* to malaria, but indirect evidence suggests that it does not enter human habitations to any great extent, only 1 male being taken in the course of a year as compared with 237 males of the typical form.

DUKE (H. L.). **Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. I. A Review of existing Knowledge on this Subject, with some general Observations.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 99–118, 19 refs. **II. On the transmitting Power of different Races of** *Glossina*.—*T.c.*, pp. 119–121, 3 refs. **III.** *Glossina morsitans* **versus** *Glossina palpalis* **as a Transmitter of the polymorphic Group of Trypanosomes.**—*T.c.*, pp. 123–130, 2 refs. Liverpool, 10th April 1933.

The first paper of this series, in which it is proposed to consider the more obvious factors that constitute the natural environment of

trypanosomes of the group of *Trypanosoma brucei*, consists largely of a general review of the results of dissection of game tsetse by different workers in various parts of Africa. A consideration of these results suggests that the adjustment between the mammalian trypanosomes and the tsetse-flies on which they depend in nature is not very close. Of the pathogenic mammalian trypanosomes, the group infesting the proboscis only (*Trypanosoma vivax* and its allies) is almost always the most widely distributed in *Glossina*, that infesting the proboscis and gut (*T. congolense* and its allies) is next in order of frequency, and the polymorphic (*brucei*) group (*T. rhodesiense, T. gambiense*, etc.) infesting the gut and salivary glands is the least numerous. In theory, transmission experiments with laboratory bred flies should yield a higher rate of infection than that obtaining naturally. Actually the carrying power of *Glossina*, under what appear to be abnormally favourable conditions, rarely exceeds 20 per cent. when an adequate number of flies is used. There are indications that the full carrying capacity of a given tsetse population in nature may often remain untested owing to the prevalence in the area of food animals that are unsuitable as hosts for the trypanosomes that depend on *Glossina*. Baboons and large reptiles, possibly elephants, and probably hippopotamus and wild pig fall into this category. Only a limited number of individuals of any tsetse population appear to be able to act as hosts for trypanosomes, but these individuals seem to be suitable for all species whether mammalian or reptilian. The existence of double infections (in which a single fly contains two species of trypanosomes) supports this conclusion. It is probable that species and also strains of trypanosomes differ in their ability to utilise these potential carriers. It is not at all clear whether climate is an important factor in determining the infection rate. There are indications that *G. pallidipes*, Aust., may in certain circumstances attain a relatively high standard of efficiency as a carrier of the pathogenic mammalian trypanosomes. Whether this is determined by climate, by racial peculiarities or by the feeding proclivities of this fly has not yet been ascertained. Observations on unilateral infection of the salivary glands in *G. morsitans*, Westw., and *G. palpalis*, R.-D., and on the infection of *G. morsitans* with *T. grayi* have already been noticed [*R.A.E.*, B, xxi, 123].

The second paper gives the results of experiments undertaken to determine whether different races of tsetse from different localities vary appreciably in their susceptibility to infection with trypanosomes. Groups of *G. palpalis* from two isolated localities in Uganda 20 miles apart were fed on monkeys infected with *T. gambiense* or *T. rhodesiense*. Dissection of the flies that died after the first day or two and, after a suitable time (usually 30 days), of those that survived showed a striking agreement between the two groups, 3 per cent. of 1,066 flies in one group being infected and 2·9 per cent. of 1,114 flies in the other.

During the latter part of 1932, experiments were carried out at Entebbe to compare the transmitting power of *G. palpalis* and *G. morsitans*, using various strains of trypanosomes, and the results are given in the third paper. In the author's experiments out of 2,238 individuals of *G. morsitans* and 2,355 of *G. palpalis*, 6·6 and 3 per cent. respectively were found to contain flagellates, figures that correspond very closely to those obtained by Kleine and Fischer in 1913 in which the respective infection rates were 6·1 and 2·9 per cent. out of 881 individuals of each species. It thus appears that *G. morsitans* is a

more efficient vector of trypanosomes of the polymorphic group than *G. palpalis*, but under the conditions of experiment prevailing at Entebbe even this species is poorly adjusted to their requirements. A strain of *T. gambiense* considered to be non-transmissible by *G. palpalis* (as the result of testing with several thousand flies) proved also to be non-transmissible by *G. morsitans*.

YORKE (W.), MURGATROYD (F.) & HAWKING (F.). **Studies in Chemotherapy. X. Further Observations on the Transmissibility of Tryparsamide-resistance by** *Glossina*.—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 157–178, 9 refs. Liverpool, 10th April 1933.

In this paper details are given of the experiments with strains of *Trypanosoma brucei* in *Glossina morsitans*, Westw., and *G. palpalis*, R.-D., the conclusions from which have already been noticed [*R.A.E.*, B, xxi, 113], together with further observations on the same subject that confirm them. Some evidence was obtained suggesting that the strain of *T. brucei* used was more easily transmissible by *G. morsitans* than by *G. palpalis* [see preceding paper].

DAVIS (N. C.), LLOYD (W.) & FROBISHER (M.). **The Transmission of Neurotropic Yellow Fever Virus by** *Stegomyia* **Mosquitoes.**—*J. Exp. Med.*, lvi, no. 6, pp. 853–865, 6 refs. New York, 1st December 1932.

Studies on the transmission of neurotropic yellow fever virus by mosquitos [*Aëdes aegypti*, L.] have a bearing on the theoretical question of its reversion to the viscerotropic type, and on the practical problem of vaccination against yellow fever, which is at present carried out by injecting a small dose of living neurotropic virus and simultaneously administering large amounts of immune serum. In view of the small amount of virus used and the difficulty with which mosquitos acquire infection with the strain, it is not considered that vaccinated persons would become a menace even in the absence of isolation and protection by screens. About 150 mosquitos fed on a man 15 hours after vaccination were allowed to feed on a healthy monkey (*Macacus rhesus*) 30, 34, 37 and 41 days later, but no temperature reaction developed and serum from this monkey later proved to have no protective power against yellow fever virus in mice.

Mosquitos fed on two monkeys inoculated 24 hours previously with Asibi and French murine strains of yellow fever virus at their 22nd and 100th passages respectively, produced fever and subsequent immunity in normal monkeys on which they were allowed to feed after suitable incubation periods [*cf. R.A.E.*, B, xxi, 14]. Details are given of attempts to transmit the French neurotropic strain of the virus at passages from the 149th to the 181st to monkeys and mice by means of mosquitos either by feeding or injection, and to maintain it in monkeys with intermediate passage through mosquitos. It was shown that passage through mosquitos did not cause reversion of the virus from the neurotropic to the viscerotropic type, and it could not be maintained in them so easily as the latter, but instances occurred in which encephalitis was produced (both in monkeys and suckling mice) by the bites of the mosquitos. The fixed and fundamentally changed nature of the neurotropic French strain was thus confirmed. Its adaptation to mouse brains does not signify attenuation; under certain conditions it is still lethal to monkeys. The

fact that it cannot be maintained in the mosquito host so easily as the viscerotropic strains is doubtless attributable in part to a smaller amount of virus ingested, because of its scarcity in the blood stream.

MARTINI (E.) & TEUBNER (E.). **Ueber das Verhalten von Stechmücken, besonders von** *Anopheles maculipennis*, **bei verschiedenen Temperaturen und Luftfeuchtigkeiten.** [On the Behaviour of Mosquitos, especially *A. maculipennis*, at various Temperatures and Air-humidities.]—*Beih. Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 1, pp. 1–80, 10 figs., 2 pp. refs. Leipzig, 1933.

The technique employed in these investigations is described by both authors. Teubner reports on work in Germany on differences in longevity at different temperatures and air-humidities, on the preferred humidity at a given temperature, on the preferred temperature at a given humidity, and on observations on mosquitos in the field, including the hibernation quarters of *Anopheles maculipennis*, Mg., and *Culex pipiens*, L. Martini, who worked in Germany and Italy, deals with the present position of the theory of races of *A. maculipennis* and on the summer life of this species. The eggs are considered to provide satisfactory racial characters [*R.A.E.*, B, xx, 57, 211], and it has been found that the banded eggs of the typical *A. maculipennis* (recently named *basilei* by Falleroni) may be distinguished from the banded eggs of the race *messeae*, Falleroni, and that among the grey eggs the light-grey (*labranchiae*, Falleroni) can be distinguished from the brown-grey (*atroparvus*, van Thiel). Martini refers the black egg mostly to *messeae*; it probably occurs in very hot seasons and regions.

Points of the summary referring to *A. maculipennis* are as follows: Adult life was longest at low temperatures and at 80–90 per cent. humidity, summer individuals being less resistant than winter ones. Even under experimental conditions the mosquitos sought a humid environment, but this was evident only at high temperatures and usually not before the second or third night, the preferred degree of humidity being usually between 80 and 95 per cent. The reaction to microclimatic differences as shown by choice of place was more rapid in summer individuals than in winter ones, and in newly emerged individuals than in older ones. It increased in intensity with the interval from the last ingestion of food or water. Winter individuals sought the cooler places at the beginning of hibernation. Behaviour in nature agreed with that in experimental conditions. The doctrine of the endophily of *A. maculipennis*, *i.e.*, that this species usually lives in closed spaces and only bites there, is incorrect, especially for malarious countries. In the case of *A. maculipennis* var. *messeae* in summer the morning hours were those during which biting chiefly took place. No definite data were obtained as to the other races.

A. maculipennis preferred for hibernation damp places with a saturation deficiency of 1·9–2·6 mm. (var. *messeae* in cellars). At a higher temperature the preferred saturation deficiency was 1·1–1·9 (var. *atroparvus* in animal quarters). The differences in morphology and bionomics between *messeae* and *atroparvus* are outlined. Both bite man freely in summer. There was no marked difference in their average fat-content in hibernation. In experiments the preferred hibernation temperatures were 6–8°C. [42·8–46·4°F.] for *messeae*

and 10–13°C. [50–55·4°F.] for *atroparvus*, and in the field the former appeared to avoid high temperatures and saturation deficiencies more than the latter. At about 20°C. [68°F.] the eggs of *messeae* matured more quickly than those of *atroparvus*. In Germany *messeae* and *atroparvus* have no connection with a given method of keeping cattle. The occurrence or predominance of one or other of the chief races of *A. maculipennis* in houses or animal quarters depends on conditions of temperature and humidity and may consequently vary with the climate or type of construction of buildings in different localities. If *labranchiae* is not merely a southern modification of *atroparvus*, it may prove to be more resistant to heat and dryness than either *atroparvus* or *messeae*, and thus be able to maintain association with man in houses avoided by the latter races.

Among the explanations offered for the decrease of *Anopheles* in summer, the greatest importance is attached to the view that this is merely a disappearance from houses and animal quarters to neighbouring shelters with a favourable microclimate. In conclusion it is pointed out that differences in racial food-preferences are not involved in these investigations, which attempt another explanation of the occurrence of Anophelines without malaria. It is possible that a high percentage of domestic mosquitos containing human blood may not indicate a preference for human blood but favourable microclimatic conditions in dwellings as compared with animal quarters.

DE BUCK (A.) & SWELLENGREBEL (N. H.). **On Anophelism without Malaria around Amsterdam. IV. The Pattern of the Dorsal Surface of the Ova in the two Races of** *A. maculipennis.—Proc. Akad. Wetensch. Amst.*, xxv, no. 10, pp. 1335–1339, 1 pl., 4 figs., 4 refs. Amsterdam, 1932.

A comparison of the eggs of the short-winged and long-winged races of *Anopheles maculipennis*, Mg., in Holland with the microphotographs of the dappled grey eggs and the barred or banded eggs recently described by Hackett, Martini and Missiroli as those of the races var. *labranchiae*, Falleroni, and var. *messeae*, Falleroni, in Germany and Italy [*R.A.E.*, B, xx, 211] suggests that the two races correspond. The authors point out, however, that this fact would not appear to be so from the descriptions given. In the eggs from Holland there is no light background nor any bars of pigment concealing portions of the grey ground. The chorion is uniformly black and is covered by the exochorion to which the float structures belong. The pattern of the eggs is due solely to the arrangement of the slender, upright, white rods (columellae) interspersed with minute granular processes with which the dorsal surface of the exochorion is covered. Where the columellae are longest, broadest and closest together, the dorsal surface is mainly white (appearing like a mosaic of polygonal white patches divided by a fine network of black lines). Where they are shortest, narrowest and farthest apart, it appears mainly black with tiny white spots. Thus the dark mottling of the dappled grey eggs, the bars of the barred eggs and other effects of " pigmentation " concealing " the light background " are all due to the shorter and more slender columellae on these spots, which conceal the black background less effectually than do the longer and stouter columellae of the grey patches.

The ventral surface of the exochorion, submerged in water when the egg is floating, is covered with knob-shaped processes, much

shorter than the columellae, some of which are slightly thicker than others. These are arranged to form the meshes of a rather coarse network. In the water the ventral surface is covered with a layer of air which gives it the appearance of silver finely mottled with black (the tips of the knobs), with a network of slightly elevated ridges, marking the position of the thicker knobs. The authors point out that it is often difficult to decide whether an isolated egg belongs to a short-winged or long-winged race, and it is generally necessary to base conclusions on the appearance of a batch of eggs laid by one female ; otherwise they agree with Hackett, Martini and Missiroli that each race can be identified by the pattern of the dorsal surface of the ovum.

ADLER (S.). **Mode de transmission des protozoaires sanguicoles et particulièrement des leishmanioses (Rapport introductif).**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 207–222, 35 refs. Paris, 1933.

The knowledge that has been acquired during the past 40 years on the transmission of protozoan blood parasites, particularly *Leishmania*, is briefly discussed.

RAYNAL (J.) & LE GAC (P.). **Leishmaniose viscérale infantile et phlébotomes à Marseille.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 249–251, 5 refs. Paris, 1933.

Owing to the frequency with which infantile kala-azar occurs in the south-east of France, and to the fact that it has been reported to be increasing in Marseilles, a sand-fly survey of the town and its environs was carried out from 14th July to 21st September 1932. Three species were taken, *Phlebotomus perniciosus*, Newst. (293 males and 292 females), *P. papatasii*, Scop. (11 males and 5 females) and *P. larroussei*, Lang. & Nitz. (1 female) [*cf. R.A.E.*, B, xxi, 27]. Thus the predominant species is that which is believed to be the vector of the disease in Sicily [xix, 217]. The sand-flies appeared to be most numerous along the coast and on the outskirts of the town, where the disease is also reported to be most prevalent.

KOFOID (C.) & DONAT (F.). **The experimental transfer of *Trypanosoma cruzi* from naturally infected *Triatoma protracta* to Mammals in California.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 257–259, 8 refs. Paris, 1933.

Further work on the trypanosome, described as *Trypanosoma triatomae* [*R.A.E.*, B, iv, 181], found in *Triatoma protracta*, Uhler, from the nests of a wood rat, *Neotoma fuscipes*, in California, has led the authors to consider it a synonym of *Trypanosoma cruzi*, which has not been definitely known to occur in America north of Honduras. *Mus* (*Rattus*) *norvegicus*, an opossum (*Didelphis virginiana*) and *N. fuscipes* were successfully infected with *T. cruzi*, by intraperitoneal inoculation of the gut contents of the bug diluted with Locke's solution, by eating infected bugs, or by having the faeces of infected bugs diluted with 0·75 per cent. salt solution placed beneath the eyelid. No cases of Chagas' disease have been recorded from California, though brief illness, and more rarely prolonged illness, has been reported following the bite of *T. protracta*. The known distribution of infected bugs is restricted, though both bugs and wood rats occur together over wide areas in California.

SWELLENGREBEL (N.) & DE BUCK (A.). **Les races hollandaises de l'*Anopheles maculipennis* et leurs rapports avec les races italiennes.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 273–282, 14 refs. Paris, 1933.

After briefly summarising the characters (chiefly biological) distinguishing the two races of *Anopheles maculipennis*, Mg., that are found in Holland [*R.A.E.*, B, xviii, 52 ; xix, 241, etc.] and correlating these characters with those used by Roubaud to distinguish races of this mosquito [xx, 212], the authors discuss the possible identity of these races with *A. maculipennis* var. *messeae*, Falleroni, and *A. maculipennis* var. *labranchiae*, Falleroni, in Italy and Germany [xv, 71 ; xx, 211, 213, etc.]. The eggs appear to correspond [xxi, 137]. Observations on zoophilism in the long-winged, fresh-water race, characterised by barred eggs (which corresponds to the eurygamic, homodynamic group of Roubaud) [xvii, 221], and in *A. maculipennis* var. *messeae* [xv, 181] would appear to corroborate the suggestion that they are identical, but in the opinion of Roubaud it is among the eurygamic, homodynamic populations that the races of undifferentiated zoophilism chiefly occur [*cf.* xx, 213]. Moreover, the differentiated zoophilism of the short-winged, salt-water race characterised by dappled eggs (which corresponds to Roubaud's stenogamic, heterodynamic group and is said by him to have lost its dangerous character wherever conditions of human life have permitted the free exercise of animal deviation during the epidemic season) does not agree well with the reported feebleness of the zoophilic tendency of *A. maculipennis* var. *labranchiae* in Italy. There are, therefore, at least two races in the group with dappled eggs, a race with differentiated zoophilism in Holland and one with undifferentiated zoophilism in Italy, and the authors suggest that the names var. *atroparvus*, van Thiel [xv, 180] and var. *labranchiae* be retained for these two races respectively. It is also pointed out that a name should be given to the large-winged race with undifferentiated zoophilism that is reported by Roubaud [xx, 212] in order to render the nomenclature sufficient until such time as the races shall have been studied in other countries. On the other hand, the characters of semihibernation (heterodynamy), halophilism and stenogamy, previously believed to be found only in the short-winged race from Holland are also found in var. *labranchiae*. The authors state that they would be willing to accept the names *messeae* and *labranchiae* as designating systematic units on condition that these systematic units should be recognised as complex groups from the point of view of biology and consequently of epidemiology. There appears to be no reason why the long-winged race from Holland and var. *messeae* should not be considered one race, and Roubaud may be right in affirming that this race approaches to the primitive form of *A. maculipennis* so that it may not even be necessary to separate it from the latter, although it would seem worth while in that case to separate the long-winged race and var. *messeae*, both of which have a differentiated zoophilism, from the large mass of eurygamic, homodynamic Anophelines with undifferentiated zoophilism [xx, 212]. It thus appears that differences in the morphology of the eggs are not sufficient to distinguish the races that are dangerous from the malarial point of view unless the habits of the races are also known, as in Holland. On the other hand, both the short-winged race and var. *labranchiae* breed only in brackish water, and in Holland at least, advantage may

be taken of this fact in organising control measures; in Italy the situation is complicated by the presence of *A. sacharovi*, Favr. (*elutus*, Edw.) and of *A. superpictus*, Grassi.

ROUBAUD (E.), TOUMANOFF (C.) & GASCHEN (H.). **Les données de l'indice maxillaire rapportées au rôle infectant des anophèles de l'Indochine septentrionale.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 282–293, 1 fig., 4 graphs, 4 refs. Paris, 1933.

With a view to applying Roubaud's theory that races of *Anopheles maculipennis*, Mg., that prefer human or animal blood can be distinguished by the average number of maxillary teeth [*R.A.E.*, B, xvi, 210], an examination was made of the maxillary armature of 3,143 Anophelines collected during 1932 from Tonkin, northern Annam and Laos and comprising *Anopheles hyrcanus* var. *sinensis*, Wied., *A. vagus*, Dön., *A. minimus*, Theo., *A. jeyporiensis*, James, *A. aconitus*, Dön., and *A. maculatus*, Theo., which showed that the average maxillary indices were 15·7, 14·2, 11·3, 11·9, 11·5 and 11·4 respectively. Out of 1,451 individuals of the first species none was found infected with malaria parasites, and only 2 individuals out of 1,337 of the second species, whereas the other four are known vectors of malaria in Indo-China. *A. minimus*, which is the most important, had the lowest average number of teeth. From a comparison of the averages obtained it was not found necessary to count the teeth on both maxillae nor to use a large number of individuals in order to obtain figures that are sufficiently accurate [*cf.* xviii, 145]. Determination of the maxillary index of several of the species in different regions showed that it is fairly constant. Examination of a small number of individuals of *A. philippinensis*, Ludl., and *A. subpictus*, Grassi, indicates that their maxillary indices are less than 14, but they are much less widely distributed in areas where malaria is important and are not known to act as vectors.

MORIN (H. [G. S.]). **Au sujet de l'indice maxillaire des anophèles de l'Indochine septentrionale. (Essai d'analyse statistique.)**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 293–300, 2 graphs. Paris, 1933.

A statistical analysis of the material collected in Indo-China in 1932 for the study of the maxillary index of Anophelines described in the preceding paper confirmed the results obtained. In species that are most abundant in regions where malaria does not occur the index is high, whereas in those that have previously shown the highest percentages of natural infection with malarial parasites it is low. It is pointed out that the maxillary index may prove of value in regions where species of Anophelines are numerous by limiting the search for the most important local vector to those that have a small number of teeth.

ROUBAUD (E.) & STEFANOPOULO (G.). **Recherches sur la transmission par la voie stégomyienne du virus neurotrope murin de la fièvre jaune.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 305–309, 3 refs. Paris, 1933.

A more detailed account is given of experiments already noticed [*R.A.E.*, B, xxi, 14] in which attempts were made to transmit to *Macacus rhesus* by means of *Aëdes aegypti*, L., strains of yellow fever

that had been maintained in mice in order to ascertain whether the virulence of such strains would be renewed by passage through mosquitos. Similar experiments using a French murine strain at its 171st and 172nd passages gave negative results. These and other experiments [*R.A.E.*, B, xxi, 135] confirm the fact that the neurotropic virus that has been maintained in mice for long periods is not easily transmitted by mosquitos. Moreover, after a number of passages through mice, the characters of the virus have changed and it does not appear able to recover its normal virulence immediately by passage through mosquitos. However, the persistence of the virus for several days in the circulation, the possible recovery of its normal virulence for monkeys, and the fact that encephalitis was produced in both monkeys and mice by the bites of mosquitos infected with the neurotropic virus suggest that the greatest care should be taken in the employment of such a virus for the vaccination of man.

MATHIS (M.). **Sur le pouvoir infectant des** *Macacus rhesus* **vaccinés contre la fièvre jaune.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 310–313, 4 refs. Paris, 1933.

A monkey injected with a 0·01 dilution of the emulsified brains of mice infected with yellow fever murine virus at its 140th passage, was bitten 19 hours later by about 20 individuals of *Aëdes aegypti*, L. (*argenteus*, Poir.). Two healthy monkeys bitten by these mosquitos 16 and 21 days respectively after the infecting feed did not contract the disease, and inoculations of emulsions of the mosquitos into monkeys and mice one month after the infecting feed also gave negative results, despite the fact that the virus was proved by inoculation into mice to be circulating in the blood of the original monkey at the time of the infecting feed.

NICOLLE (C.). **Unité ou pluralité des typhus. (Rapport introductif.)**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 316–340. Paris, 1933.

The author discusses further his reasons for considering that historic or epidemic typhus and murine or endemic typhus are distinct diseases [*cf. R.A.E.*, B, xx, 245]. The symptoms produced in man and laboratory animals (guineapigs and rats) are described, and it is pointed out that, in the case of the latter, the varied manifestations may be due to differences in the source from which the inoculated material is obtained (brain, tunica, etc.). In lice [*Pediculus humanus*, L.] inoculated *per rectum* with the epidemic virus, mortality does not begin until the 6th day, whereas with the endemic virus it begins on the 3rd day and is complete on the 6th. In *Xenopsylla cheopis*, Roths., however, the period of conservation of each virus is about the same, although the multiplication of the murine virus is more intense. In discussing the epidemiology of the two diseases, the author records that in the phosphate mines of southern Tunisia he observed epidemics of typhus among native workmen infested with lice that did not spread to uninfested Europeans working beside them despite the fact that fleas were abundant in the galleries and frequently attacked man. Moreover, in northern Africa, it is almost impossible to avoid becoming infested with fleas on entering a native dwelling, but Europeans do not contract typhus unless they become infested with lice. Thus, although transmission of epidemic typhus from rats by fleas is possible experimentally, the part played by them under

natural conditions is at most exceptional and probably purely hypothetical. On the other hand, endemic typhus is a disease of rats transmitted by *Polyplax spinulosa*, Burm., and various fleas, and is only contracted by man accidentally after long and close association with rat fleas.

In a discussion following this paper, P. Lépine does not consider that the distinctness of the two diseases is definitely proved and points out that there are both virulent and non-virulent strains of murine typhus, which react differently. In a virulent strain the scrotal reaction in guineapigs became irregular at the 16th passage and did not reappear after the 20th ; at its 55th passage it was indistinguishable from the virus of epidemic typhus. He also states that lice infected by feeding on monkeys infected with either virus live for a similar length of time, their excreta becoming virulent from the 5th day and death occurring about the 15th day. Observations made at the beginning of an outbreak of epidemic typhus at Drama in Greece showed that although the first five cases occurred almost simultaneously in the same block of houses, none was infested with lice and there had been no opportunity for contact between them. It would thus appear that the only possible common factor was the murine population that passes from house to house. Four of the five cases were women (a sex predominance that has also been noticed in Athens), and it is suggested that this is due to the fact that women remain more constantly in the house than men and, owing to their type of clothing, are more easily attacked by fleas. A strain of the virus isolated from one of these cases and maintained in guineapigs showed reactions intermediate between those of epidemic and endemic typhus.

MARCANDIER (—), PLAZY (—) & PIROT (R.). **Fièvre boutonneuse dans le milieu maritime à Toulon.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 354–365, 16 refs. Paris, 1933.

During recent years, further investigations have been made on Marseilles fever at Toulon, where it was originally confused with murine typhus [*cf.* *R.A.E.*, B, xx, 99]. The disease has so far only been found among those living on shore, on the outskirts of the town, in contact with dogs infested with the tick, *Rhipicephalus sanguineus*, Latr., and is much less frequent than murine typhus, which occurs exclusively on board ship, only 10 cases of the former disease being recorded in the last 5 years as opposed to more than 130 cases of the latter. Moreover, Marseilles fever both at Toulon and elsewhere has been reported during the summer (July and August) whereas murine typhus has occurred during November and December. With regard to the vector, it would appear that the tick only infests man accidentally. The disease has been transmitted experimentally to man, white rats and guineapigs by the inoculation of a suspension of ticks collected from a dog belonging to a man suffering from the disease, and also by blood inoculation from monkey to rat, from rat to guineapig, and from man to monkey, rat and guineapig [*cf.* xx, 182, 247]. The tendency to progressive weakening of the virus of Marseilles fever on successive passages through guineapigs contrasts with the stability of the Toulon strain of murine typhus, which shows no attenuation at its 31st passage. Moreover, there is a tendency to relapse in the former that is absent in the latter. Cross-immunity tests in guineapigs and monkeys also served to confirm the distinctness

of the two viruses, although in certain cases a slight modification of the reaction in guineapigs suggests that there may be a certain degree of immunity (group immunity) between the two viruses.

PHILIP (C. B.) & PARKER (R. R.). **Rocky Mountain Spotted Fever. Investigation of Sexual Transmission in the Wood Tick** *Dermacentor andersoni.—Publ. Hlth. Rep.*, xlviii, no. 11, pp. 266–272, 6 refs. Washington, D.C., 17th March 1933.

An account is given of attempts to test whether the persistence of the virus of Rocky Mountain spotted fever in *Dermacentor venustus*, Banks (*andersoni*, Stiles) [*R.A.E.*, B, xvii, 125] may be due in part to transmission from one sex to the other in copulation. Transmission of the virus from infected males to normal females was demonstrated in 4 out of 11 tests; in 1 out of 12 tests an inapparent infection, producing a low-grade reaction, was transmitted from a female to a male. The total incubation period of the virus in both hosts (the female tick and the guineapig on which it was fed) was in one instance 14 days from copulation and in another more than 20. As the occurrence of the organisms in spermatozoa of the ticks has previously been demonstrated, it is possible that the infection may sometimes be inherited directly from the male as well as from the female parent. The low percentage of infected ticks in nature (usually less than 3 per cent. in the Bitterroot Valley, Montana) makes the chance of the pairing of two infected ticks relatively small.

PONS (R.). **Spirellose fébrile cochinchinoise.**—*Rev. Méd. Hyg. trop.*, xxv, no. 1, pp. 17–23, 1 fig., 2 charts. Paris, 1933.

An account is given of the symptoms in man and laboratory animals of the disease caused by *Spirochaeta* (*Spirella*) *sinensis*, which was first observed by the author in Cochin China in 1923, with notes on the morphology and culture of the spirochaete. The recorded cases have all been associated with the presence of the tick, *Rhipicephalus sanguineus*, Latr., but a few experimental attempts at transmission have not proved it to be a vector.

HOEPPLI (R.) & FENG (L. C.). **Experimental Studies on Ticks.**—*Chinese Med. J.*, xlvii, no. 1, pp. 29–43, 4 pls., 27 refs. Peiping, January 1933.

The following is taken from the authors' summary. The lesions in the skin due to *Hyalomma detritum perstrigatum*, Schulze, *Argas vespertilionis*, Latr. (*pipistrellae*, Aud.), *Ixodes* sp. (probably *persulcatus*, Schulze) and *Boophilus* sp. in natural infection in China are described and discussed in comparison with the changes produced by other ticks [*cf. R.A.E.*, B, xvi, 46, 184; xx, 16].

The salivary glands of *Dermacentor sinicus*, Schulze, from hedgehogs and *H. detritum perstrigatum* from cattle contain a powerful anticoagulin [*cf.* xvii, 227]. Emulsions prepared from such glands had a very marked inhibitory effect on the coagulation of rabbit blood *in vitro*.

Emulsions prepared from eggs of *D. sinicus*, *Haemaphysalis campanula hoeppliana*, Schulze, and *Hyalomma detritum perstrigatum* were very toxic when injected into dogs and rodents. None of the various animals, which usually died from 1 day to 2 weeks after the injection, showed symptoms of tick paralysis [*cf.* xix, 180]. The histological changes observed are described.

Papers noticed by Title only.

Sergent (Ed.), Sergent (Et.), Parrot (L.), Donatien (A.) & Lestoquard (F.). **Revue historique du problème de la transmission des leishmanioses.**—*Bull. Soc. Path. exot.*, xxvi, no. 2, pp. 224–248, many refs. Paris, 1933.

Dyer (R. E.), Badger (L. F.), Ceder (E. T.) & Workman (W. G.). **Endemic Typhus Fever of the United States : History, Epidemiology and Mode of Transmission.**—*J. Amer. Med. Assoc.*, xcix, no. 10, pp. 795–801, 75 refs. Chicago, 1932. [*Cf. R.A.E.*, B, xxi, 117.]

Marshall (J. F.) & Staley (J.). **A new British Record of** *Orthopodomyia pulchripalpis* **Rondani (Diptera, Culicidae).**—*Nature*, cxxxi, no. 3308, p. 435, 3 refs. London, 25th March 1933.

Serafim, jr. (J.) & Davis (N. C.). **Distribution of** *Aëdes* (*Taeniorhynchus*) *taeniorhynchus* (**Wiedemann**). *Aëdes* (*Taeniorhynchus*) *jacobinae*, **new species** [both in Brazil].—*Ann. Ent. Soc. Amer.*, xxvi, no. 1, pp. 13–19, 2 pls., 3 refs. Columbus, Ohio, March 1933.

Hinman (E. H.). **Enzymes in the Digestive Tract of Mosquito Larvae.**—*Ann. Ent. Soc. Amer.*, xxvi, no. 1, pp. 45–52, 16 refs. Columbus, Ohio, March 1933.

Borgmeier (R.). **Duas especies novas de Tabanidae do Brasil (Dipt.).**—*Rev. Ent.*, iii, fasc. 1, pp. 1–5, 2 figs. Rio de Janeiro, 22nd March 1933.

Fischer (C. R.). **Sobre a distribuição geographica de** *Tabanus importunus* **Wied. (1828).** [The Geographical Distribution in Brazil of *T. importunus*.]—*Rev. Ent.*, iii, fasc. 1, p. 134. Rio de Janeiro, 22nd March 1933.

Macfie (J. W. S.). **A New Species of** *Culicoides* [*C. judaeae*] **from Palestine.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 79–81, 1 fig. Liverpool, 10th April 1933.

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Tribe Muscini, Subfamily Muscinae, based on a comparative Study of the Male Terminalia. I. The Genus** *Musca* **Linnaeus.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 135–156, 11 figs., 6 refs. Liverpool, 10th April 1933. [*Cf. R.A.E.*, B, xx, 282.]

Séguy (E.). **Mission Saharienne Augiéras-Draper, 1927–1928. Insectes Diptères** [including description of larva of *Hypoderma corinnae*, Crivelli, infesting gazelles and antelopes].—*Bull. Mus. Hist. nat.*, (2) v, no. 2, pp. 122–127, 9 figs. Paris, February 1933.

Senevet (G.), Colas-Belcour (J.) & Gil Collado (J.). **De la présence, en différents points de l'Afrique du Nord** [Tunisia, Algeria and Spanish Morocco] **de** *Dermacentor niveus* **Neumann** [on wild boars].—*Bull. Soc. Path. exot.*, xxvi, no. 1, pp. 29–31, 7 refs. Paris, 1933.

Lewis (E. A.). *Rhipicephalus ayrei* **n. sp. (a Tick) from Kenya Colony.**—*Parasitology*, xxv, no. 2, pp. 269–272, 2 figs., 1 ref. Cambridge, April 1933.

AFRICA (C. M.). **An Arthropod associated with a chronic Dermatitis involving the Face.**—*Philipp. J. Sci.*, l, no. 2, pp. 205–208, 2 pls., 3 refs. Manila, February 1933.

Demodex folliculorum, Simon, said to occur in 50 per cent. of the population in all parts of the world, is generally regarded as a harmless parasite. The author reports the finding of an Arthropod answering the description of this mite in association with a rather severe dermatitis superimposed on the edges of healed mustard-gas lesions on the face. The histopathology of these is described. The use of various ointments in the course of 10 years had given no relief. A series of applications of ethyl chloride spray, which had previously been found effective in the treatment of various skin conditions due to metazoan parasites, gave a remarkably favourable result.

KOUWENAAR (W.), SNIJDERS (E. P.) & WOLFF (J. W.). **Onderzoekingen over mijtekoorts. I. Inleiding.** [I. Investigations on Mite Fever. I. Introduction.]—*Ned. Tijdschr. Geneesk.*, lxxvi, no. 40, pp. 4640–4647. Haarlem, 1st October 1932.

KOUWENAAR (W.), SNIJDERS (E. P.) & WOLFF (J. W.). **II. Infectieproeven op apen.** [II. Infection Experiments with Monkeys.]—*T.c.*, no. 41, pp. 4746–4757, 6 figs., 8 refs., 8th October 1932.

WOLFF (J. W.) & KOUWENAAR (W.). **III. Infectieproeven bij konijnen.** [III. Infection Experiments with Rabbits.]—*Op. cit.*, lxxvii, no. 3, pp. 269–280, 21st January 1933. (With Summaries in English and German.)

The first paper surveys the present state of knowledge of Sumatran mite fever or Deli pseudotyphus, including notes on its transmission by *Trombicula deliensis*, Walch [*R.A.E.*, B, xiii, 84, 153, 183] and a discussion of other fevers of the typhus group. The second and third describe experiments in which monkeys were infected by intracutaneous injections of blood, etc., from hospital patients, and rabbits by intratesticular injections.

BRUG (S. L.) & DE ROOK (H.). **Filariasis in Nederlandsch-Indië, IV.**—*Geneesk. Tijdschr. Ned.-Ind.*, lxxiii, no. 5, pp. 264–279, 1 map, 2 graphs, 9 refs. Batavia, 28th February 1933. (With a Summary in English.)

A survey is given of unpublished records of filariasis and elephantiasis in the Malay Archipelago in continuation of previous work [*R.A.E.*, B, xix, 146]. New preparations received from New Guinea and Melanesia contained *Filaria* (*Microfilaria*) *bancrofti* exclusively; *F. malayi* did not seem to occur further eastward than the Moluccas and the Lesser Sunda Islands. In northern Ceram, where *F. bancrofti* occurred very sporadically, investigation showed a positive correlation between *F. malayi* and elephantiasis in all the 30 villages examined. The development of *F. malayi* was traced in *Mansonia uniformis*, Theo., up to the final mobile stage, but owing to lack of material, localisation in the proboscis could not be seen. Normal development occurred in *Anopheles bancrofti*, Giles, up to the 7th day, after which examples of this mosquito could not be kept alive. No development was observed in 3 females of *A. parangensis*, Ludl., nor in 1 of *A. subpictus*, Grassi. In observations on the Upper Digoel River, New Guinea, where *Culex fatigans*, Wied., is a very recent importation [*cf.*

xix, 28], the development of *F. bancrofti* was completed in only 2 females of this mosquito out of 13. In this region *F. bancrofti* has been transmitted for a very long time by other mosquitos and has possibly lost its capacity for development in *C. fatigans*. Its development was observed in *A. bancrofti* up to 6½ days, when the mosquitos died.

CRAWFORD (R.). **The Structure of the Head of some Anopheline Larvae.**—*Malayan Med. J.*, viii, no. 1, pp. 25–38, 18 figs. Singapore, March 1933.

This paper is intended to include only observations that appear to supplement or conflict with those made by Puri [*R.A.E.*, B, xix, 227]. The investigation was based on *Anopheles maculatus*, Theo., with frequent reference to *A. hyrcanus*, Pall., *A. kochi*, Dön., *A. umbrosus*, Theo., and *A. aitkeni*, James, though no specific variation was found. Observations on the feeding process are included.

GATER (B. A. R.). **Notes on Malayan Mosquitoes, I. The Genus** *Anopheles*.—*Malayan Med. J.*, viii, no. 1, pp. 39–42. Singapore, March 1933.

In this preliminary survey a list is given of the species of *Anopheles* occurring in Malaya, with some notes on synonymy. The author divides the genus into the subgenera *Anopheles* and *Myzomyia*. The former contains the group *Anopheles*, comprising the series *Anopheles*, *Myzorhynchus* and *Lophoscelomyia*; the latter contains the groups *Neomyzomyia*, *Myzomyia* and *Pyretophorus*, which are not subdivided into series. In the series *Anopheles* are included *A. aitkeni*, James, with var. *bengalensis*, Puri, *A. brevipalpis*, Roper, *A. lindesayi* var. *cameronensis*, Edw., and *A. wellingtonianus*, Alcock. *Myzorhynchus* includes *A. albotaeniatus*, Theo., *A. barbirostris*, Wulp, *A. barbumbrosus*, Strick. & Chowdh., *A. hunteri*, Strick., *A. hyrcanus* var. *sinensis*, Wied., and var. *nigerrimus*, Giles (*peditaeniatus*, Leic. [*cf. R.A.E.*, B, xx, 33]), *A. montanus*, Stant. & Hack., *A. novumbrosus*, Strick., *A. separatus*, Leic., and *A. umbrosus*, Theo., together with an unnamed variety of it. In *Lophoscelomyia* is *A. asiaticus*, Leic. The group *Neomyzomyia* comprises *A. aurirostris*, Watson, *A. kochi*, Dön., *A. leucosphyrus*, Dön., *A. hackeri*, Edw., *A. tessellatus*, Theo., and *A. watsoni*, Leic. In *Myzomyia* are *A. aconitus*, Dön., *A. annularis*, Wulp, *A. karwari*, James, *A. maculatus*, Theo. (including examples of the type of *dravidicus*, Chr.), and *A. philippinensis*, Ludl. Most of the specimens described from Malaya as *A. annularis* (*fuliginosus*, Giles) were actually *A. philippinensis*, but the true *A. annularis* occurs in northern districts. It is possible that the Indian and Netherlands East Indian *A. pallidus*, Theo., has also been confused with these two. In *Pyretophorus* are *A. sundaicus*, Rdnw., *A. subpictus* var. *malayensis*, Hack., and *A. vagus*, Dön. Specimens of a larval form of *A. aitkeni*, which it has been suggested might be *insulaeflorum*, Sw. & Sw., do not conform to the description of the latter. *A. similissimus*, Strick. & Chowdh. (*similis*, Strick.) (series *Myzorhynchus*) has not been observed since its original description (based on larval characters) from Malaya, and the occurrence of *A. minimus*, Theo., and *A. jamesi*, Theo. (group *Myzomyia*) is doubtful. *Anopheles hackeri* is considered to be specifically distinct from *A. leucosphyrus* [*cf.* ix, 133], as it has been found to differ in the larval as well as in the adult stage.

GATER (B. A. R.). **Notes on Malayan Mosquitos, II. Seasonal Distribution.**—*Malayan Med. J.*, viii, no. 1, pp. 42–45, 6 graphs, 5 refs. Singapore, March 1933.

Convinced that in Malaya larval surveys alone do not give a true indication of the numbers of mosquitos [*R.A.E.*, A, xix, 71 ; xxi, 8], the author made a record of the adults trapped in 1929 between an outer and an inner mosquito net over a bed. The outer net has openings that are closed by flaps at intervals during the night for the mosquitos to be collected. Graphs are given showing the seasonal variation in the numbers of Culicines and Anophelines and of the separate species trapped. Six species (*Anopheles philippinensis*, Ludl., *A. hyrcanus* var. *sinensis*, Wied., *A. vagus*, Dön., *Culex fatigans*, Wied., *C. gelidus*, Theo., and *C. vishnui*, Theo.) had a maximum incidence in June–October, a period of relatively low rainfall except for October. The maximum of *A. maculatus*, Theo., was in March and that of *A. hyrcanus* var. *nigerrimus*, Giles, in April–June, while *A. kochi*, Dön., had two maxima, in March–May and November–December.

During the same period only 574 female Anophelines were caught in 10 rooms that were searched daily, as against 5,408 in the bed-trap.

MILNE (J. C.). **Some Malayan Culicines.**—*Malayan Med. J.*, viii, no. 1, pp. 46–49, 10 refs. Singapore, March 1933.

Lists are given of 11 species of Culicines found at Taiping (Malaya), distinguishing adults taken in houses and larvae from natural and artificial collections of water, together with notes on breeding habits, mostly supported by data from the literature.

HOFFMANN (W. E.). **The Life-history of a Second Species of *Laccotrephes* (Hemiptera, Nepidae).**—*Lingnan Sci. J.*, xii, no. 2, pp. 245–256, 1 pl. Canton, 4th April 1933.

An account is given of observations on the bionomics of *Laccotrephes* sp., which, like *L. kohlii*, Ferrari [*R.A.E.*, B, xv, 233], has been observed in South China attacking a variety of aquatic insects, particularly mosquito larvae. All stages are described, and the technique of rearing this bug is discussed. Hibernation occurs in the adult stage, and there are probably four generations a year. One female laid 45 eggs from 1st August to 21st September 1925, and 51 eggs from 27th April to 4th June 1926.

DE JESUS (P. I.). **Hydrodynamics of Mosquito Breeding Places.**—*Amer. J. Hyg.*, xvii, no. 2, pp. 502–514, 2 figs., 9 refs. Baltimore, Md., March 1933.

Observations were made on the resistance of Anopheline larvae to flowing water in a typical breeding-place in the Philippines [*cf.* *R.A.E.*, B, xx, 122]. Though some larvae were found in the stagnant water of seepage pools and surface wells, they were more numerous in water flowing at 0·05–0·55 ft. per second, and occurred also at greater velocities. One was found 1 ft. from the bank where the current was 1 ft. per second, but they are apparently not able to withstand this velocity continuously. When the mean velocity (or velocity 1 ft. from the bank) increased in the rainy season to 3 ft. per second no larvae were found in the stream.

Matheson (R.), Boyd (M. F.) & Stratman-Thomas (W. K.). *Anopheles walkeri*, **Theobald, as a Vector of** *Plasmodium vivax*, **Grassi and Feletti.**—*Amer. J. Hyg.*, xvii, no. 2, pp. 515–516. Baltimore, Md., March 1933.

Females of *Anopheles walkeri*, Theo., from New York State have been found to be efficient experimental vectors of benign tertian malaria.

Boyd (M. F.) & Ponton (G.). **The Recent Distribution of Malaria in the south-eastern United States.**—*Amer. J. Trop. Med.*, xiii, no. 2, pp. 143–166, 8 graphs, 13 maps, 3 diagr. Baltimore, Md., March 1933.

From a comparison of the incidence of malaria in South Carolina, Georgia, Alabama and Florida with the topography and precipitation of those States, the authors conclude that the peculiar distribution of intense malaria in this region coincides with a topography that is moulded through erosion by solution of the underlying geological formations (limestone or other calcareous strata). In such areas the usual superficial erosion channels by which the surface water is carried off are not developed to any great extent, since a large proportion of the rainfall is diverted underground, but the falling-in of the roofs of the caves thus formed produces basin-shaped depressions on the surface devoid of outlet, in which surface water is retained in wet summers. Such depressions provide breeding-places for *Anopheles quadrimaculatus*, Say, in temporary water, and malaria is intensified in these areas in wet summers. Many smaller, more permanent basins are occupied by a dense growth of vegetation, with accumulations of vegetable débris, and these produce an acid reaction in the water that favours *A. crucians*, Wied., rather than *A. quadrimaculatus*. On the other hand, the reaction of the water of limesinks, of sluggish streams flowing from large springs, and of many of the basins that are temporarily filled with water in wet seasons is alkaline and such waters are preferred by *A. quadrimaculatus*. The former type of situation prevails in the sandy flat woods outside the limestone area, where *A. quadrimaculatus* is scarce and *A. crucians* the prevalent Anopheline. It may be that a further factor is the influence of the limestone on the reaction of the water.

Russell (P. F.). **Malaria in the Philippine Islands.**—*Amer. J. Trop. Med.*, xiii, no. 2, pp. 167–178, 24 refs. Baltimore, Md., March 1933.

The situation with regard to malaria in the Philippines, its prevalence, vectors and control, is reviewed from the literature. At present it is only possible to state that the *funestus-minimus* subgroup of *Anopheles* appears to contain the vectors. The relative susceptibility to infection of *A. filipinae*, Mnlg., *A. mangyanus*, Banks, and *A. minimus* var. *flavirostris*, Ludl. [*R.A.E.*, B, xx, 235] has not yet been determined, although two definitely infective individuals of *A. minimus* var. *flavirostris* have been found in several hundred dissections. It is estimated that at present not more than $2\frac{1}{2}d.$ [at par] per head could be appropriated annually for malaria control in the average small malarious community in the Philippines (in many

places not even this amount is available), and although there have been a number of instances of successful control of malaria by using Paris green against Anopheline larvae, no malaria project for typical small communities has been devised that is within the means of the inhabitants.

DUNN (L. H.) & CLARK (H. C.). **Notes on Relapsing Fever in Panama with Special Reference to Animal Hosts.**—*Amer. J. Trop. Med.*, xiii, no. 2, pp. 201–209, 8 refs. Baltimore, Md., March 1933.

Information on relapsing fever in Panama and Colombia is reviewed [*R.A.E.*, B, viii, 196; ix, 198; xi, 200; xvi, 46; xix, 213]. In the course of investigations in the laboratory at Panama during the past three years, naturally acquired spirochaetal infection resembling that occurring in man has been found in a number of mammals. Some of the data obtained have already been noticed [xix, 213]. Infection has been found in a total of six opossums, and the range of localities where these animals were taken suggests that the disease is fairly widespread among them. The spirochaetal infection of opossums was as readily transmitted to rats and mice as that of man. Two armadillos inoculated intraperitoneally with blood containing numerous spirochaetes of a human strain both contracted the disease. Similar spirochaetes were found in a horse and in calves. In the latter case they were successfully transmitted to a monkey and subinoculated into rats. Larval forms of *Ornithodorus talaje*, Guér., were found on opossums and marmoset monkeys (*Leontocebus geoffroyi*).

TOWNSEND (C. H. T.). **Note on** *Anopheles* **of the** *Nyssorhynchus* **Group (Diptera: Culicidae).**—*Ent. News*, lxiv, no. 4, pp. 101–102. Philadelphia, Pa., April 1933.

TOWNSEND (C. H. T.). **On** *Nyssorhynchus tarsimaculatus* **Goeldi and the Races of** *Nyssorhynchus*.—*Rev. Ent.*, iii, fasc. 1, pp. 7–12. Rio de Janeiro, 22nd March 1933.

In the first paper a key is given to the females of the Brazilian species of the *Nyssorhynchus* group of *Anopheles*. The employment in it of the character of the presence or absence of a terminal white ring on the fourth fore tarsal joint led to the discovery that *A. tarsimaculatus*, Goeldi, is a synonym of *A. albimanus*, Wied. The *A. tarsimaculatus* of Howard, Dyar & Knab and subsequent authors is a distinct species without a white ring on the fourth fore tarsal joint, and the name *A. gorgasi*, D. & K., is available for it. The species included in the key are *A. gorgasi*, *A. albimanus*, *A. bachmanni*, Petrocchi, *A. albitarsis*, Arrib., *A. argyritarsis*, R.-D., and *A. darlingi*, Root.

In the second paper the author modifies his views as to the identity of *A. tarsimaculatus*, auct. Comparison of various characters, particularly those of the eggs, suggest that *A. gorgasi* may be identical with *A. albimanus* (*tarsimaculatus*, Goeldi), *A. tarsimaculatus*, auct. being distinct. The whole question is further complicated by variations in certain characters and in adult habits among members of the *Nyssorhynchus* group, which are briefly discussed, and the author concludes that it will only be possible to define these forms satisfactorily by recognising geographical and physiological races as separate entities.

Shannon (R. C.). **Correction**—*Proc. Ent. Soc. Wash.*, xxxv, no. 4, p. 58. Washington, D.C., April 1933.

Anopheles (*Stethomyia*) *thomasi*, n.n., is proposed for *A. lewisi*, Shannon [*R.A.E.*, B, xix, 187], as the latter name is preoccupied by *A. lewisi*, Ludl., which is a synonym of *A. maculipennis*, Mg.

Boyd (M. F.). **Successful Cage Rearing of** *Anopheles quadrimaculatus*.—*Science*, lxxvi, no. 1973, pp. 370–371, 1 ref. New York, 21st October 1932. [Recd. May 1933.]

By means of the method recently noticed [*R.A.E.*, B, xxi, 36], 5 successive lineal generations of *Anopheles quadrimaculatus*, Say, have been reared between 18th February and 17th July 1932. The periods over which the various stages of each generation were present are shown. The rate of multiplication increased with each generation. The occurrence of pairing was proved by the production of fertile eggs; the adults obtained compared favourably in size with wild individuals. The males are fed on raisins and the females on the person of the attendant, their only blood supply. The indefinite propagation of this strain is expected; its possession is of the greatest advantage in the transmission of naturally induced malaria and offers opportunities for research previously unavailable.

Shute (P. G.). **The Life-history and Habits of British Mosquitoes in Relation to their Control by Antilarval Operations.**—*J. Trop. Med. Hyg.*, xxxvi, no. 6, pp. 83–88, 1 chart. London, 15th March 1933.

In view of the fact that the 28 species of mosquitos present in England differ greatly in their biology, and particularly in the time of occurrence of the larval period, on a knowledge of which control measures must be based [*cf. R.A.E.*, B, xiii, 186], a chart is presented showing the months in which the various stages of the different species occur. Notes are also given on the bionomics of the 18 more important species, based on observations by the author during the past ten years. The British mosquitos may be divided into groups according to hibernation habits and number of generations produced annually. *Mansonia* (*Taeniorhynchus*) *richiardii*, Ficalbi, and most of the species of *Aëdes* are single-brooded. The eggs of the latter are laid indiscriminately on the ground throughout the summer and are carried by the winter rains and melting snows into depressions in woods and on commons. When they reach a permanent collection of water, the larvae hatch and develop as far as the fourth instar, at which stage development is suspended until warm weather in spring, when pupation quickly occurs and emergence takes place within a few days. Larvae cannot usually be found during the summer. *Culex*, *Theobaldia*, *Anopheles* and a few species of *Aëdes* have more than one generation annually and their larvae are present throughout the summer, provided that the breeding grounds contain water. The winter may be passed in the egg and larval stages, as in the case of one species of *Anopheles* (*plumbeus*, Steph.) and 3 or 4 of *Aëdes*, the eggs of which latter hatch after remaining in water for 2 or 3 months, the larvae developing slowly until the following spring; or in the larval stage only, in which case the eggs hatch on being covered with water (usually during October) and the larvae develop slowly up to

the fourth instar, after which they remain quiescent until the spring; or as a female adult, as in the case of one species of *Anopheles* (*maculipennis*, Mg.), one of *Culex* (*pipiens*, L.) and two of *Theobaldia*.

In England, *A. maculipennis* is more abundant in the low-lying coastal districts than inland, where it never appears to be numerous even if ideal breeding grounds are plentiful. The larvae prefer the edges of open grassy lakes and pools. The preference shown by the adults for certain types of buildings is considered to be due to the kind of building rather than to the animal concerned, observations having indicated that this species appears to select shelters that are dark and ill-ventilated, provided that the necessary condition of food is fulfilled [xviii, 227]. Feeding continues throughout the winter, the activity of the digestive organs being lessened as the temperature falls; at 80°F. a meal is taken every 48 hours, but at 60° it takes 5 days to digest and at 40° about 30. There is a cessation of visible ovular development during the winter, and attempts to cause reactivation by subjecting the females to heat and allowing them to feed repeatedly every 48 hours were unsuccessful in October and November but successful in January, when the essential period of rest appeared to have been passed and the ovaries developed rather quickly, oviposition occurring a few weeks earlier than in nature [xviii, 33; xx, 213]. Only a few individuals survive the winter, however; the numbers of engorged adults present in a pigsty remain fairly constant from October to December, after which they diminish rapidly until April, and by the beginning of May the species is only found with difficulty. It is only rarely that *A. maculipennis* hibernates in cellars, church towers, etc., away from animals, and the presence of blood in the stomach appears to be essential for survival; engorged adults collected during the winter and kept at 60°F. until digestion was completed died within 10 days on being subjected to 1°C. [33·8°F.], but at this temperature individuals filled with blood lived for months. This race does not develop a fat-body.

Roubaud (E.) & Gaschen (H.). **Insuffisance des caractères de l'oeuf pour la distinction des races trophiques et biologiques de l'***Anopheles maculipennis*.—*Bull. Soc. Path. exot.*, xxvi, no. 3, pp. 447–451, 1 pl., 11 refs. Paris, 1933.

The distinction of races in *Anopheles maculipennis*, Mg., is primarily of interest from the point of view of their ability to transmit malaria, and the author points out that the dangerous races (those showing undifferentiated zoophilism) cannot be distinguished by the characters of the eggs from those showing a differentiated zoophilism. Among the micropterous Anophelines with dappled grey eggs of the type of var. *labranchiae*, Falleroni, two biological races may be distinguished. The first, showing undifferentiated zoophilism, occurs in northern Africa, southern Italy, southern Spain, Corsica, etc., where malaria is most severe, and is the most dangerous race known; studies on strains from the Pontine marshes, Murcia and Algeria [*R.A.E.*, B, xx, 212] show that it is eurygamic and homodynamic [but *cf.* xxi, 139]. The second is the micropterous race from Holland (var. *atroparvus*, van Thiel), which shows differentiated zoophilism and is stenogamic and heterodynamic. Although these races cannot be distinguished by their eggs, they may be definitely separated by their respective maxillary indices [*cf.* xvi, 210; xix, 162; xx, 151].

The anthropophilous, eurygamic, homodynamic race with spotted eggs is paucidentate, having an absolute predominance of individuals with not more than 14 teeth, whereas the zoophilous, stenogamic, heterodynamic race (*atroparvus*) is multidentate, with a maxillary index in the neighbourhood of 17.

Among the Anophelines with barred eggs of the type of var. *messeae*, Falleroni, two biological races may also be distinguished, the macropterous race from Holland, which is eurygamic and homodynamic, and a race from England, Normandy and Spain, which is stenogamic and heterodynamic. Both these races show differentiated zoophilism and have a high maxillary index.

ADVIER (M.). **Etude sur les puces de la région de Dakar.**—*Bull. Soc. Path. exot.*, xxvi, no. 3, pp. 452–454. Paris, March 1933.

In view of the fact that data on fleas occurring in Senegal [*cf. R.A.E.*, B, xviii, 269 ; xix, 86] have been found unreliable owing to confusion of *Synosternus pallidus*, Tasch., with *Xenopsylla cheopis*, Roths. [xix, 221 ; xx, 203], further material was collected throughout 1932 in and near Dakar, comprising 26,830 fleas from small mammals and 16,762 from native huts (either from the floor or the body or clothes of man). *X. cheopis* was the commonest species on rats and mice, and was, also found on shrews and occasionally on the palm rat, which was, however, chiefly infested by *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch. *Echidnophaga gallinacea*, Westw., was about one-third as frequent. Of *Pulex irritans*, L. [*cf.* xix, 254], only one individual was recorded. *S. pallidus*, which does not remain on its host after feeding, was almost the only flea attacking man. In the sandy floors of native dwellings it occurred in very great numbers, being about 800 times as common as *X. cheopis*, which was not found living on man. *S. pallidus* was scarce on rodents, but was found on them in July and August, when driven out of the sand by the rains, and again in late November. In this connection it is noted that in 1932 human plague in the Dakar region chiefly occurred in July, August and early December, at which times murine plague was discovered wherever man was infected. *C. felis* was found several times in town dwellings in association with cats ; in two instances it was the predominant species in rooms in which cases of bubonic plague occurred.

ADVIER (M.). **Sur l'épidémiologie de la peste au Sénégal.**—*Bull. Soc. Path. exot.*, xxvi, no. 3, pp. 465–472. Paris, March 1933.

ADVIER (M.) & DIAGNE (A.). **Observations épidémiologiques sur la peste à Dakar (Décembre 1932).**—*T.c.*, pp. 388–389.

In the first paper the author opposes the theory that bubonic plague in Senegal is sometimes transmitted by fleas direct from man to man [*R.A.E.*, B, xx, 203]. There is no positive evidence of such transmission, and failure to demonstrate plague in samples of rats or other rodents, or to find the bodies of dead ones near the scene of an outbreak, is no proof that there has been no epizootic, since infected rodents often die in inaccessible burrows or in the bush. Actually at Dakar since 1922, in every year in which an epidemic has occurred, plague has been found in a proportion of the rats examined. The incidence of human bubonic plague has been sporadic, and no case has been found, since one reported in 1923, of a healthy man carrying the

infection [*cf.* xviii, 93]. Of the possible vectors of inter-human infection, *Pulex irritans*, L., is very rare [see preceding abstract] and *Synosternus pallidus*, Tasch., has only a slight infectivity. Of 25 batches of the latter collected from huts in which plague had occurred, infection was demonstrated (by inoculation into laboratory animals) only in one. Moreover, since this flea normally lives in the sandy floors of huts and does not often bite without first emptying its intestine, an infected individual does not seem likely to remain infective for long. The author believes that infection is always derived from rats, usually through *Xenopsylla cheopis*, Roths. He also disagrees, in the light of more recent and carefully diagnosed cases, with the current belief that plague is less often fatal in Senegal and the pneumonic form less contagious than elsewhere, except in so far as its transmission is reduced by the effect of the hot climate.

In the second paper the authors note that an apparent instance of man-to-man transmission of bubonic plague was afterwards invalidated by the discovery of dead and infected rats under the floor of the house in which the cases occurred. Examples of *S. pallidus* and *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch., were found in the house, but were not infected. Furthermore, there was no time for an incubation period between the occurrence of the different cases, which affords additional evidence that all were infected from the rats by *X. cheopis*.

RAYNAL (J.) & LE GAC (P.). **Note sur un phlébotome du groupe *minutus* capturé à Sainte-Maxime (Var).**—*Bull. Soc. Path. exot.*, xxvi, no. 3, pp. 455–458, 2 figs., 3 refs. Paris, March 1933.

A description is given of a female *Phlebotomus*, believed to be *P. parroti*, Adl. & Theo. [*cf. R.A.E.*, B, xix, 161], from a new locality in southern France.

GIBSON (A.). **Mosquito Investigations in Canada during 1931.**—*23rd–24th Ann. Rep. Quebec Soc. Prot. Pl. 1930–32*, pp. 137–148. Quebec, 1932. [Recd. May 1933.]

In this survey of mosquito investigations and control work in Canada in 1931, a list is given of the 20 species so far recorded from Kamloops, British Columbia. At Banff, Alberta, control work was hampered by beavers damming the drainage ditches. In the Ottawa district, owing to the unusually dry season, the species breeding in pools of melted snow (notably *Aëdes stimulans*, Wlk.), as well as *A. sticticus*, Mg. (*hirsuteron*, Theo.) and *A. vexans*, Mg., which breed in flood-waters and rainwater pools respectively, were relatively scarce, while there was a slight increase in Anophelines, chiefly *Anopheles maculipennis*, Mg., and *A. punctipennis*, Say.

TWINN (C. R.). **Summary of Insect Conditions in Canada, in 1930.**—*23rd–24th Ann. Rep. Quebec Soc. Prot. Pl. 1930–32*, pp. 149–168. Quebec, 1932. [Recd. May 1933.]

This survey includes some notes (pp. 163–4) on pests of man and animals. In Manitoba cattle, horses, dogs and man were affected by an unusually severe outbreak of *Stomoxys calcitrans*, L. (stable-fly) and cattle by great numbers of *Lyperosia irritans*, L. (horn-fly). In British Columbia a severe infestation of cattle by *Dermacentor venustus*, Banks (*andersoni*, Stiles) resulted in many cases of tick paralysis.

Gertson (G. D.), Lancaster (W. E. G.), Larson (G. A.) & Wheeler (G. C.). *Wohlfahrtia* **Myiasis in North Dakota. Report of two Cases.**—*J. Amer. Med. Ass.*, c, no. 7, pp. 487–488, 10 refs. Chicago, Ill., 18th February 1933.

After reviewing the literature on myiasis caused by the larvae of *Wohlfahrtia vigil*, Wlk., the authors record two cases of infestation in infants in North Dakota ; in one case a single larva was obtained from the pubic region and in the second four larvae were taken from the adnexa of the eye.

Bishopp (F. C.). **The Cattle Tick : Its Biology and Control.**—*Abstr. Doct. Dissert. Ohio St. Univ.*, no. 9, pp. 17–28. [Columbus, Ohio] 1932. [Recd. May 1933.]

An account is given of the bionomics of *Boophilus annulatus*, Say, which transmits *Piroplasma bigeminum*, the causal agent of Texas fever of cattle, much of the information being similar to that already noticed [*R.A.E*, B, ii, 102 ; iv, 2]. This tick is normally only present in the southern United States, where it is thought to be indigenous and is responsible for an estimated annual loss of £8–40 millions. The number of eggs deposited is influenced by the size and degree of engorgement of the female, the maximum among 53 well-engorged individuals collected at various times of the year being 4,547, and the average 2,967. Records made during several years indicate that incubation is retarded to some extent by the presence of moisture in the soil beneath the eggs. The longevity of the larvae ranges from a few days under extremely unfavourable temperature conditions to many months, the maximum period recorded being 246 days. Data accumulated from 1906 to 1911 are tabulated, showing that in general the non-parasitic period (from the dropping of the engorged female until the last of its progeny that have not found a host is dead) is shortest for ticks that engorge in May–July and longest for those that do so in September–November, thus illustrating the value of eradication measures in the spring and summer. The length of the parasitic period occupies 21–55 days, complete development occurring on a single host. There are no well defined broods, but from a study of the length of time occupied by the pre-oviposition and the incubation periods during different seasons of the year and the developmental period on suitable hosts, it is apparent that five generations a year are possible in Texas. Observations have shown that a direct relation exists between the condition of cattle and the degree of infestation ; ticks attacking animals on maintenance and on fattening rations developed in about the same time, but a greater number reached maturity on the former.

The major method of dissemination is through the transport of livestock, though the fact that engorged females placed in hay as it was baled laid eggs that hatched indicates the danger of distribution by means of such commodities. Eggs, larvae and un-engorged females are capable of withstanding considerable periods of submergence and may thus be carried by streams, especially those in flood. Studies on the effect of temperature on the various stages indicate that winter temperatures constitute a dominant factor in restricting the northern distribution of this species ; humidity is probably the principal factor limiting its normal occurrence in the south-western United States.

Birds, including poultry, feed on the ticks, and predacious insects, particularly ants of the genus *Solenopsis*, destroy many engorged females and eggs.

This tick may be eradicated by several methods involving its starvation on infested areas and elimination from its hosts by pasture rotation or dipping. In laboratory experiments with arsenical dips on ticks removed from the host, it was found that females in different stages of engorgement were equally susceptible, and that less than 1 per cent. of those completely submerged laid viable eggs, while the majority died without ovipositing. The duration of submersion did not influence the percentage of mortality. By applying the solution to various parts of the ticks, it was found that the effect did not vary greatly, and the area of the integument covered appeared to be the dominant factor. An interval of 14 days elapses between the dipping treatments, which are continued for 7–8 months. Tests showed that neither burning the pasture nor ploughing can be relied upon to kill all the ticks in a given area, and though burial of engorged females at depths of 1–3 ins. in different types of soil resulted in a high percentage of mortality, some larvae hatched from buried eggs and migrated to the surface.

The addition of sulphur to the food or the water is ineffective in protecting the animals from infestation.

KELSER (R. A.). **Mosquitoes as Vectors of the Virus of Equine Encephalomyelitis.**—*J. Amer. Vet. Med. Ass.*, lxxxii (N.S. xxxv), no. 5, pp. 767–771. Chicago, Ill., May 1933.

Females of *Aëdes aegypti*, L., fed on guineapigs 48 or 72 hours after the inoculation of the latter with equine encephalomyelitis became infected, and also to a less extent after 96 or 120 but not after 144 hours. They transmitted fatal infection to guineapigs and to a horse on which they were fed 6–18 days after the infective meal; they were not tested after a shorter or a longer interval. This is the first evidence that this disease, the type of which occurring in the United States has been shown to be due to a filterable virus, is transmissible by an insect vector.

MITCHELL (W. C.) & COBBETT (N. G.). **Notes on the Life Cycle of *Oestrus ovis*.**—*J. Amer. Vet. Med. Ass.*, lxxxii (N.S. xxxv), no. 5, pp. 780–781, 3 refs. Chicago, Ill., May 1933.

The larval stage of *Oestrus ovis*, L., in spring lambs in Texas and New Mexico was found to last 2½–3½ months, which is less than the period commonly assigned to it elsewhere [*R.A.E.*, B, xiii, 163, etc.].

LEVER (R. A.). **Entomologist's Annual Report for the Year 1931–32.**—*Brit. Solomon Is. Prot. Agric. Gaz.*, i, no. 1, pp. 3–6. Tulagi, January 1933.

Lyperosia exigua, de Meij., causes considerable annoyance to cattle on Guadalcanal and the Russell Islands. It would be almost impossible to control it by treatment of the cattle dung in which it breeds, and though kerosene sprays are fairly toxic, any dips or sprays could only be of temporary value. The possibility of introducing parasites of the genus *Spalangia* from Java may eventually be considered [*cf.* *R.A.E.*, B, xx, 258].

HOLLAND (E. A.). **An Experiment in the Control of Malaria in New Ireland by Distribution of** *Gambusia affinis*.—*Trans. R. Soc. Trop. Med. Hyg.*, xxvi, no. 6, pp. 529–538, 1 map. London, 5th May 1933.

In New Ireland, Bismarck Archipelago, the geography, topography and climate of which are discussed, the only Anophelines found are *Anopheles punctulatus*, Dön., which usually breeds in clear water, and *A. punctulatus* var. *moluccensis*, Sw. & Sw. de G., which is present in clean and dirty water, both being important vectors of malaria. Benign and malignant tertian are endemic, the latter being the more usual. In 1931–32, the spleen rate for 6,095 native children in the Kavieng district was 30·9 per cent. The population is declining annually, and statistics of infant and child mortality, for 227 villages of high and low spleen rates, have led to the conclusion that this is chiefly due to malaria.

In 1930, *A. punctulatus* var. *moluccensis* and *Culex* sp. were extremely abundant at Kavieng, breeding in drains and ponds. Attempts at control were unsuccessful until in February 1931 about 100 individuals of *Gambusia affinis* were introduced from Rabaul. Multiplication took place immediately in the drains, and the number of mosquitos was diminished in a few weeks. The ponds, however, required re-stocking from the drains before breeding could be controlled. *Aëdes aegypti*, L. (*argenteus*, Poir.) and *A. scutellaris*, Wlk. (*variegatus*, Dol.), which were also abundant, were quickly dealt with in tanks, guttering and other domestic waters.

Following this success, fish were captured from the drains and introduced from May to December into all the known Anopheline breeding-places over an area containing 32 coastal villages and having 3,000 native inhabitants, of whom 960 were children. The summarised results of surveys, the climatic conditions during which are indicated as being of importance in the fluctuations in spleen rates, show rates of 24·6 in August 1930, 16·8 in February 1931, 12·8 in October and 4·2 in July 1932 as compared with 47·1, 23·9, 24·7, and 28·8, respectively, in untreated areas comprising 35 villages having a native population of 3,438, of whom 890 were children. Moreover in the treated area births have exceeded deaths for the first time.

This fish is being liberated in other localities, and breeding ponds are being established in outlying situations. The re-stocking of waters constituting temporary breeding grounds for Anophelines is considered impracticable, and it is hoped that as a result of stocking permanent waters the mosquitos surviving will be insufficient to colonise temporary waters after a dry period. From the fact that numbers of fish resembling *G. affinis* were observed about 20 miles out to sea and also that this species survives when transferred from ponds to brackish water and then to seawater, it is possible that individuals carried to the sea after heavy rain from drains, the water in which was brackish at high tides, may distribute themselves by entering rivers and swamps.

GREEN (R. [T. B.]) & GATER (B. A. R.). **The relative Susceptibility of some Malayan Anopheline Mosquitoes to experimental Infection with Malarial Parasites.**—*Bull. Inst. Med. Res., F.M.S.*, no. 4 of 1931, 17 pp., 15 refs. Kuala Lumpur, 1931. [Recd. May 1933.]

Some of the experiments described have already been noticed [*R.A.E.*, B, xix, 163; *cf.* xx, 168], as have the methods used for

maintaining the mosquitos [xviii, 57]. Of Anophelines fed on human malaria patients, *Anopheles kochi*, Dön., showed a higher percentage and degree of mid-gut infection with *Plasmodium falciparum* than *A. maculatus*, Theo.; the salivary gland infection of both species after 16 days was about equal, but it is probable that *A. kochi* would eventually have had a greater or more prolonged sporozoite supply. In similar comparisons of *A. kochi* with *A. philippinensis*, Ludl., and *A. vagus*, Dön., the percentages of both gut and gland infection were higher in *A. kochi*. It was also infected with *P. vivax* more readily than *A. maculatus*. The shortest interval before sporozoites of *P. falciparum* invaded the salivary glands was 11 days in *A. kochi*, 12 in *A. maculatus*, 14 in *A. vagus* and 15 in *A. philippinensis*. In tests of readiness to attack man, the percentages feeding were as follows: *A. maculatus*, 72·6; *A. vagus*, 47·8; *A. kochi*, 46·6; *A. philippinensis*, 38·9.

These experiments suggest that *A. kochi* is capable of becoming an important vector of malaria. The species, though common in many districts near human habitations, has not so far been found naturally infected in Malaya, though it has in the Netherlands Indies [x, 38; xiv, 42; xx, 69] and Assam [xix, 48].

Entomological Investigations.—*6th Ann. Rep. Coun. Sci. Industr. Res. Aust. 1931–32*, pp. 20–23. Canberra, 1932. [Recd. May 1933.]

Most of the information given in this report of the Division of Economic Entomology in Australia, including work on *Lyperosia exigua*, de Meij., and on sheep blow-flies, has already been noticed. During the year 1931–32, 270 living dragonfly larvae and 1,200 living larvae of the Chironomid, *Cardiocladius*, both predacious on *Simulium*, were successfully transported to New Zealand.

Feng (Lan-chou). **Household Mosquitoes and Human Filariasis in Amoy, South China.**—*Chinese Med. J.*, xlvii, no. 2, pp. 168–178, 1 pl., 11 refs. Peiping, February 1933.

Observations in Amoy in July–August 1931 suggested that the incidence of human filariasis is lower there than elsewhere in Fukien province, possibly owing to the scarcity of *Anopheles hyrcanus* var. *sinensis*, Wied. [*cf. R.A.E.*, B, xix, 250; xx, 6]. Of 161 prisoners examined, most of whom were not natives of Amoy, 22 were infected with *Filaria* (*Microfilaria*) *bancrofti*, hitherto regarded as the only species occurring in man in China, and 1 with *F.* (*M.*) *malayi*. This last case came from Chekiang, and an examination of 94 slides of microfilariae from this province and subsequently of 10 blood smears from filariasis cases showed all to contain *F. malayi* and none *F. bancrofti*. It is, therefore, probably the commonest, if not the only, filaria infecting man in that area. It was not found in mosquitos in Amoy. Of 10 species of mosquitos found in houses in Amoy, the commonest and the only one found infected was *Culex fatigans*, Wied., of which the percentage infected was 9 in the city and 15 in the country villages. *Aëdes aegypti*, L., was commonly caught in mosquito nets, showing that it feeds until late at night. No conclusive observations were made of *Mansonia uniformis*, Theo., which often entered houses on rainy nights, especially in the country districts, and may possibly

be a carrier of filaria [*cf.* xviii, 207; xix, 190; xxi, 145]. Of the 205 females of *Anopheles minimus*, Theo., dissected, 5 were found infected with larvae of an unknown species of filaria.

KOBAYASHI (H.). **Life-history of *Aëdes* (*Finlaya*) *koreicus* Edw.** [*In Japanese.*]—*J. Chosen Nat. Hist. Soc.*, no. 15, pp. 1–4. Keijo, Korea, January 1933.

In Korea, *Aëdes japonicus* var. *koreicus*, Edw., the adult of which is described, is common near Keijo, where it attacks man. It breeds in temporary waters and has several generations a year, the life-cycle being completed in 10–30 days or more. Pairing usually occurs before feeding, and the ovaries mature 5–6 days after the blood meal. The females may lay over 200 eggs at a time. Hibernation appears to occur in the egg stage, beginning in late September or early October.

ANAZAWA (K.). **Observations on natural Malaria-infection of the various Formosan Anophelines, with reference to the critical Value of each Species from the Malaria-epidemiological Point of View.** [*In Japanese.*]—*Taiwan Igakkai Zasshi* [*J. Med. Ass. Formosa*], xxx, no. 10 (no. 319), pp. 1027–1049, 52 refs. Taihoku, October 1931. (With a Summary in English, pp. 75–76.)

According to the author's investigations the percentage of natural malaria infection in Formosan Anophelines is as follows: *Anopheles hyrcanus* var. *sinensis*, Wied., 0·8; *A. minimus*, Theo., 2·4; *A. maculatus*, Theo., 0·4; *A. annularis*, Wulp (*fuliginosus*, Giles), 0·2; *A. tessellatus*, Theo., 1·9; *A. ludlowi*, Theo. (*hatorii*, Koidz.), 0·6; and *A. maculipalpis* var. *splendidus*, Koidz., 2·3. It is difficult to prove that *A. lindesayi*, Giles (*pleccau*, Koidz.), which does not feed readily and seldom enters houses or cow-sheds, transmits malaria, as it chiefly occurs in high mountains where the annual period when the temperature is favourable for the spread of the disease is rather short.

A. hyrcanus var. *sinensis* and *A. minimus* remain in relatively large numbers in cow-sheds and houses respectively after sucking blood. *A. maculatus* and *A. annularis*, of which the former prefers man and the latter cattle, seldom remain indoors after feeding. *A. ludlowi* (chiefly found in cow-sheds) and *A. maculipalpis* var. *splendidus* remain in relatively small numbers in cow-sheds and houses after sucking blood. The latter and *A. tessellatus* (which is more inclined to remain in large numbers) prefer human blood.

The rate of natural infection of a given species of Anopheline is in direct proportion to its feeding habits and its susceptibility to various types of malaria parasites [*cf. R.A.E.*, B, xix, 207], but its importance also depends on its abundance, since a species occurring in large numbers with a low transmitting ability may be more dangerous than another with a higher transmitting ability that only occurs in small numbers.

MORISHITA (K.) & KATAGAI (T.). **Examination of Blood in the Stomachs of *Anopheles* in Formosa.** [*In Japanese.*]—*Dobuts. Zasshi*, xlv, pp. 90–92. Tokyo, March 1933.

Of females of *Anopheles hyrcanus* var. *sinensis*, Wied., collected in the open, in cow-sheds and in houses, 2, 1·2 and 20·8 per cent.

respectively contained human blood, the corresponding figures for *A. minimus*, Theo., being 20·1, 6·4, and 69·2. *A. hyrcanus* var. *sinensis* usually feeds on cattle.

A. vagus, Dön., and *A. tessellatus*, Theo., were also found to feed on man occasionally.

Sugimoto (M.). **On the Fleas of Formosa.** [*In Japanese.*]—*Dobuts. Zasshi*, xlv, pp. 101–102. Tokyo, March 1933.

A list is given of 8 species of fleas now known in Formosa, including *Ischnopsyllus tateishii*, sp. n., from a bat. The most prevalent flea on dogs is *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch., *C.* (*C.*) *canis*, Curt., being extremely scarce. *Pulex irritans*, L., is not abundant, but man is sometimes attacked by *C. felis*, and *Xenopsylla cheopis*, Roths.

Kodama (M.) & Kōno (M.). **Studies on Experimental Transmission of Virus of "Eruptive Fever" and "Typhus" by several Blood Sucking Insects.**—*Kitasato Arch. Exptl. Med.*, x, no. 2, pp. 99–112, 20 refs. Tokyo, April 1933.

Kodama (M.) & Takahashi (K.). **Different Points of the Scrotal Reaction of Male Guinea-pigs infected with "Eruptive Fever" and "Typhus."**—*T.c.*, pp. 113–119.

In the first paper the authors restate their belief that *Rickettsia manchuriae* is the causal agent of "eruptive fever" (Manchurian typhus) and that the Mooser-bodies (which they call *R. mooseri*), causing the American endemic typhus, are identical with it, while *R. prowazeki*, causing epidemic ("historic") typhus, is a specialised form resulting from frequent passage through the louse, *Pediculus humanus*, L. (*vestimenti*, Nitzsch), and man [*cf. R.A.E.*, B, xx, 145; xxi, 141, etc.]. Attempts to transmit Manchurian typhus with *Cimex lectularius*, L., whether by injection of emulsified bugs or by natural attack, gave negative results [*cf.* xix, 117]. It proved much more difficult to infect monkeys (*Macacus rhesus*), by blood inoculation, with Manchurian typhus than with epidemic typhus; attempts to transmit the latter to guineapigs by injection of lice [? *Pedicinus*] from the monkeys were unsuccessful, as were experiments with guinea-pig-lice [? *Gyropus*] and both forms of infection. Human fleas (*Pulex irritans*, L.) [*cf.* xx, 244] apparently transmitted Manchurian typhus by injection to guineapigs from a rat but not from a slightly infected monkey (*M. rhesus*). Dogs did not prove susceptible to infection with either virus [*cf.* xx, 24], and neither was transmitted by injection of *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt. [*cf.* xx, 142], but injection of *C.* (*C.*) *felis*, Bch., infected with Manchurian typhus apparently immunised a guineapig. Experiments with the commonest Manchurian rat-fleas [*cf.* xx, 100], of which *Xenopsylla cheopis*, Roths., predominates in late autumn and *Ceratophyllus anisus*, Roths., in spring, showed that both species could transmit Manchurian typhus and (less readily) epidemic typhus either by injection of emulsified material or by natural attack, *X. cheopis* being a more efficient vector and causing a more virulent infection with a shorter incubation period. *Polyplax spinulosa*, Burm., appeared to be rare locally, and experiments confirmed the observation that *Echinolaelaps* (*Laelaps*) *echidninus*, Berl., is not a vector [*cf.* xx, 131]. Manchurian typhus was transmitted to guineapigs by injection of emulsified rat-mites (*Liponyssus nagayoi*,

Yamada) [*cf.* xix, 156], which confirms results obtained with endemic typhus and *L. bacoti*, Hirst [xx, 49, etc.], but *L. nagayoi* has not yet been found on house or field rats in southern Manchuria. The authors conclude that Manchurian typhus is essentially a disease of rodents, especially rats (Nicolle's "murine typhus"), and is transmitted to man chiefly by *X. cheopis* and *C. anisus*.

[FADDEEVA (T. D.).] **Фаддеева (Т. Д.). The Rôle of Ticks in the Transmission and Preservation of Plague Virus. Communication I. Experimental Infection of *Argas persicus* with Plague.** [*In Russian.*]—*Rev. Microbiol.*, xi, no. 4, pp. 273–279, 12 refs. Saratov, 1932. (With a Summary in English.) [Recd. May 1933.]

This paper, which is the first of a series on the possible relation of ticks to plague, describes laboratory experiments carried out in Saratov with *Argas persicus*, Oken [*R.A.E.*, B, xvi, 201]. Adults of both sexes and nymphs were fed on artificially infected guineapigs 18, 12 and 6 hours before the death of the latter, and immediately prior to it. Suspensions prepared from crushed engorged ticks at intervals after the meal showed that 11 out of 49 were infected (23·6 per cent.), infection being demonstrated in them for periods up to 110 days. In all cases, laboratory animals into which suspensions were injected were infected with plague and died within 2–6 days. Dead ticks preserved the infection for periods of up to 8 days. One of the ticks that had preserved the infection for 110 days had passed from the nymphal to the adult form, indicating that the infection may be maintained from one stage to another. Injections of suspensions of healthy ticks did not affect laboratory animals.

[EVSEEVA (V. E.) & FIRSOV (I. P.).] **Евсеева (В. Е.) и Фирсов (И. П.). The Suslik Fleas as Reservoirs of Plague Virus during Winter. Communication I.** [*In Russian.*]—*Rev. Microbiol.*, xi, no. 4, pp. 281–283, 4 refs. Saratov, 1932. (With a Summary in English.) [Recd. May 1933.]

Since contradictory results have been obtained from investigations in Russia on the ability of fleas to act as reservoirs of plague bacilli during the winter [*R.A.E.*, B, xv, 31 ; xvi, 221 ; xx, 248], experiments were begun in September 1930 with fleas collected from the nests of ground squirrels [*Citellus*] in a non-epizootic region in the former Astrakhan Government, the species involved being *Neopsylla setosa*, Wagn., *Ceratophyllus tesquorum*, Wagn., *Ctenophthalmus pollex*, Wagn. & Ioff, and *Frontopsylla semura*, Wagn. & Ioff. Of 7,970 fleas that were allowed after a period of starvation to feed on a ground squirrel and guineapigs artificially infected with a virulent strain of plague, 5,363 were returned to the nests, which were enclosed in small cotton bags and buried in the soil at depths corresponding to those of the burrows of ground squirrels. Before this, infection was demonstrated in some of the other fleas. Individual nests were dug up at the beginning of January, in mid-April and in mid-May 1931 respectively, after being in the soil for over 3, 6 and 7 months. Most of the fleas were dead, but the first nest contained 26 infected fleas out of 104 found alive, the second 11 out of 138, and the third 9 out of 135. *F. semura* was the only species in which no infection was found. Other

nests, which were dug up as late as August 1931, had probably been flooded by rain and contained no live fleas.

As plague infection may thus overwinter not only in the ground squirrels but also in their fleas, which might transmit it in spring to young ground squirrels that visit empty burrows, it is important to disinfect empty as well as inhabited burrows in regions where plague is endemic.

[Polyak (I. M.] & Tumanskiĭ (V. M.).] **Поляк (И. М.) и Туманский (В. М.). Le changement de taux saisonnier des puces dans les terriers des spermophiles** *Citellus pygmaeus* **Pall. au région de N. Tchirskaja.** [*In Russian.*]—*Rev. Microbiol.*, xi, no. 4, pp. 285–287. Saratov, 1932. (With a Summary in French.) [Recd. May 1933.]

As the district of Nizhne-Chirsk, which is situated in the eastern part of the former Province of the Don Cossacks, forms the northern boundary of the vast endemic plague regions in the south-east of European Russia, collections of fleas were made from the nests of *Citellus pygmaeus* from November 1930 to the end of July 1932 in two localities where an epizootic occurred in 1930–31. Of 9,227 fleas from 153 nests, 80·57 per cent. were *Neopsylla setosa*, Wagn., 9·05 per cent. *Ceratophyllus tesquorum*, Wagn., 7·58 per cent. *Ctenophthalmus pollex*, Wagn. & Ioff, 2·21 per cent. *Frontopsylla semura*, Wagn. & Ioff, and 0·56 per cent. an undescribed species, *Rhadinopsylla ukrainica*, Ioff (MS.), which has also been recorded from the Kherson district in southern Ukraine. The maximum number of fleas occurred in March, and the minimum in September. *N. setosa* was the prevalent species during the whole year with the exception of the month of July, when *C. pollex* became predominant ; *C. tesquorum* was found in small numbers every month, whereas *F. semura* and *R. ukrainica* did not occur in the summer.

[Lokhov (M. G.) & Samsonov (F. B.).] **Лохов (М. Г.) и Самсонов (Ф. Б.). Ueber die Anwendung von Chlorpikrin in der Bekämpfung der Läusesucht bei den Bedingungen des Dorfes.** [The Application of Chloropicrin in combating Infestation by Lice under Village Conditions.] [*In Russian.*]—*Rev. Microbiol.*, xi, no. 4, pp. 289–294, 4 refs. Saratov, 1932. (With a Summary in German.) [Recd. May 1933.]

A brief account is given of the successful use of chloropicrin for fumigating dwellings and clothing during a typhus epidemic in a district in the south-east of European Russia in the summer and winter of 1930. It was applied in fumigating chambers at the rate of 3 or 5 fl. oz. to 100 cu. ft. if poured on plates containing cottonwool and placed at different heights, or at the rate of 2 fl. oz. if sprayed inside the chamber, the exposure in all cases lasting 24 hours. All lice [*Pediculus humanus*, L.] in clothing and in test-tubes wrapped in it were killed, and the eggs, which were under observation for 7 days, did not develop. Equally satisfactory results were obtained in subsequent cases in localities where outbreaks of typhus occurred, but as the population was invariably very unwilling to bring clothing to the common fumigating chambers, methods were devised for fumigating the belongings of individual families in any village or even in camps, by using ordinary chests or pits dug in the soil. The pits were covered with planks and a 4-in. layer of soil and cracks in the chests were stopped with paper.

The fumigant was either sprayed on the walls or poured into dishes containing cottonwool. In the spraying experiments, which were carried out at a relative humidity of 74–85 per cent. and temperatures of 1·1–5·7°C. [34–42·3°F.], dosages of 1½ and 5 fl. oz. per 100 cu. ft. killed all lice in clothing, etc., in 6 and 1 hours respectively in the pits, as compared with 8 and 2 hours in the chests. Chloropicrin poured on cottonwool acted more slowly, but all lice were killed within 24 hours in both chests and pits. At a mean temperature of −18·1°C. [about −1°F.], a relative atmospheric humidity of 76 per cent. and a dosage of 1½ fl. oz. chloropicrin applied by spraying, the lice were killed in 6 hours in the pits, whereas in the chests they remained alive.

SAUTET (J.). **La diapause hibernale des larves d'***Anopheles bifurcatus.*—*Ann. Parasit. hum. comp.*, xi, no. 3, pp. 161–172, 14 refs. Paris, 1st May 1933.

In field observations in Corsica it was found that in the winter of 1932–33, when the cold weather began two months later than in the previous one, the disappearance of adults of *Anopheles claviger*, Mg. (*bifurcatus*, Mg. et auct.) was delayed by one month, whereas *Culex pipiens*, L., remained active throughout the mild weather. In 1933 the pupation of hibernating larvae of *A. claviger* did not begin till late in February, though the weather had then been warm (14–16°C. [57·2–60·8°F] at noon) for some weeks, whereas in 1926 pupae were discovered as early as 23rd January. This would suggest that pupation in spring was delayed by the late beginning of the " biological winter " and that there is a necessary minimum period of cyclical diapause [*cf. R.A.E.*, B, xiv, 123; xviii, 35, etc.].

In laboratory experiments, in which care was taken to avoid overcrowding [*cf.* xix, 82], it was found that hibernating larvae of *A. claviger* were not reactivated by a change of water or by a constant temperature of 16°C. or an alternation of 13°C. [55·4°F.] and 25°C. [77°F.]. At 32°C. [89·6°F.] they died. On adding to the water a small quantity of an oxidising agent (eau de Javelle or potassium permanganate), it was found that second and third instar larvae became active and fourth instar larvae pupated and developed to adults [*cf.* xv, 161]. Development was more rapid at a temperature above that of the outside air. The author concludes that the natural reactivation of the larvae in spring is due not to the rise in temperature alone, but to the accompanying release of oxygen by water-plants owing to their increased chlorophyll production. Pupation was accelerated experimentally by exposing larvae to sunlight at 10–16°C. [50–60·8°F.] in jars containing *Myriophyllum* and *Lemna*. This does not necessarily conflict with the theory that excessive oxygenation of the water is fatal to certain Culicines [xix, 209].

HOARE (C. A.) & COUTELEN (F.). **Essai de classification des trypanosomes des mammifères et de l'homme, basée sur leurs caractères morphologiques et biologiques.**—*Ann. Parasit. hum. comp.*, xi, no. 3, pp. 196–200, 1 fldg. table, 8 refs. Paris, 1st May 1933.

This is an attempt at a natural classification of the species of *Trypanosoma* living in mammals, according to their morphological and biological characteristics, the evolution of which is discussed. A list of the commoner species is given, in tabular form, accompanied by measurements and partly diagrammatic drawings, with records of

mammalian and insect hosts, of mammals experimentally susceptible, of geographical distribution, and of practicable laboratory cultures and associated diseases, if any.

The Work of the Tsetse Research Department of Tanganyika Territory.—*Tanganyika Standard*, 8th October 1932 – 7th January 1933, reprint 29 pp. Dar-es-Salaam, 1933.

The following series of papers was written by various members of the staff of the Tsetse Research Department with a view to informing the public of the work that is being carried out in Tanganyika Territory on various aspects of the problem of controlling *Glossina* : An introduction [by N. H. Vicars-Harris], which deals with the finances of the Department and briefly indicates the scope of the work and of the programme in hand ; "The Habits and Economic Importance of the Tsetse Fly" [by W. H. Potts], in which it is stated that the most important species in Tanganyika are *G. palpalis*, R.-D., *G. morsitans*, Westw., *G. swynnertoni*, Aust., and *G. pallidipes*, Aust. ; "The Work of the Entomological Research Station at Kikore" [by N. H. Vicars-Harris], which deals very briefly with the effect of evaporation rate on the habits of *G. morsitans* and mentions puparial parasites and a puparial trap ; "The Feeding Grounds of the Tsetse, and its Relation to Game" [by C. H. N. Jackson], in which the effect of hunger on the movements of the fly is discussed ; "Notes on Traps used in Tanganyika" [by C. F. M. Swynnerton]; "Vegetation in Relation to the Tsetse Problem" [by B. D. Burtt], in which the particular type of vegetation inhabited by each species of fly is described, with notes on the relation of vegetation to reclamation and the control of new invasions of fly and on the use of air surveys in determining the distribution of types of vegetation ; "The Reclamation of Land from Tsetse in Shinyanga" [by S. Napier Bax], in which the various methods of clearing are mentioned, with a brief account of the reclamation that has already taken place or is in hand at the moment ; "The Settlement of Natives on Land reclaimed from Tsetse" [by — Hatchell] ; and "A General Summary of the Tsetse Campaign in Tanganyika : its History and Results" [by the Director, C. F. M. Swynnerton].

Daubney (R.) & Hudson (J. R.). **Rift Valley Fever.**—*E. Afr. Med. J.*, x, no. 1, pp. 2–19, 6 charts, 13 refs. Nairobi, April 1933.

An account is given of experiments in Kenya in the transmission of the virus of Rift Valley fever [*cf. R.A.E.*, B, xix, 207], which has been shown to be pathogenic to man, besides various species of monkeys, rodents and domestic animals, excluding horses and pigs. Attempts to demonstrate transmission by mosquitos were hampered by the difficulty of inducing them to feed on laboratory animals. The infection was, however, transmitted to mice and lambs by inoculation, at intervals extending to 9 days after a meal of infected blood, with *Mansonia fuscopennata*, Theo., *M. versicolor*, Edw., and *M. microannulata*, Theo., which are all common in the Rift Valley fever area, and also, within 7 days, with other Culicines, which may perhaps be excluded on epidemiological grounds as natural vectors, as well as with nymphs of *Rhipicephalus appendiculatus*, Neum., though these lost their infectivity during the moult to adults. There was no significant difference in infectivity between mosquitos fed for 8 days on susceptible blood and those that received the blood of an immune animal between the last infective

meal and the inoculation. One attack conferred on sheep a very high degree of immunity, which extended to the unweaned lambs of immune mothers. Since older sheep are comparatively resistant, outbreaks may be expected to occur at intervals of 2 generations, apparently coinciding with the 4–5 year intervals between rainfall maxima, which also appear to influence the incidence of outbreaks, probably owing to variations in mosquito density. Rift Valley fever has been shown to be immunologically distinct from yellow fever and dengue.

GORDON (R. M.) & DAVEY (T. H.). **Notes on a Medical Survey of the Sierra Leone Development Company's Camps at Sahrmarank and Pepel, Sierra Leone.**—*Ann. Rep. Med. Sanit. Dept. Sierra Leone 1931*, pp. 69–76, 6 refs. Freetown, 1933.

The opening of two labour camps at a season when food was scarce caused an influx of natives from all parts of the Colony and Protectorate of Sierra Leone, and as it was thought that this might result in the introduction or increase of certain transmissible diseases not common in the district, 1,405 individuals were examined for sleeping sickness, filariasis, etc., and a search was made for the insect vectors of such diseases. Little evidence of the presence of tropical disease was obtained, although a few cases of infestation with *Onchocerca volvulus* were diagnosed.

In one camp 140 tsetse-flies, all *Glossina palpalis*, R.-D., were caught in the uncleared area and 22 in the cleared area. Of 118 dissected, 14 were infected, 4 with trypanosomes of the *Trypanosoma vivax* type and 3 with those of the *T. congolense* type. Staining of the gut contents of the remaining 7 flies revealed the presence of an unfamiliar trypanosome in addition to those of the *T. congolense* type. *Anopheles gambiae*, Giles (*costalis*, Theo.), a vector of *Filaria* (*Wuchereria*) *bancrofti*, was prevalent, and of 215 individuals dissected 42 contained filariae. An examination of the native and European dwellings gave an Anopheline rate of 0·17 per room for the former and 2·9 for the latter. Dissection of 203 *A. gambiae* and 1 *A. funestus*, Giles, from the camp, and 46 *A. gambiae* from a neighbouring village, showed malaria öocysts in 3 and sporozoites in 35.

Anophelines found breeding in swamps in the vicinity were *A. gambiae*, *A. obscurus*, Grünb., *A. marshalli*, Theo., *A. funestus*, *A. hargreavesi*, Evans, *A. rhodesiensis*, Theo., *A. squamosus*, Theo., *A. coustani* (*mauritianus*) var. *paludis*, Theo., and *A. coustani* var. *ziemanni*, Grünb.

In a second camp, situated on Pepel Island, 301 *G. palpalis* were taken, 264 in the uncleared area and 37 in the cleared area ; of the 150 flies dissected, 8 were infected, the trypanosomes found including examples of the groups of *T. vivax* and *T. congolense* and of the unidentified trypanosome. In neither camp were infections of the salivary glands observed. Of 89 *A. gambiae* dissected during the rainy season, 15·7 per cent. were infected with filariae, presumably *F. bancrofti*. A few individuals of *Chrysops longicornis*, Macq., were taken, but no infection with *F.* (*Loa*) *loa* was found in the six dissected. In the course of a survey of the European houses and native huts both in the camp and in a neighbouring village during the dry season, only a single individual of *A. gambiae* was taken. This absence of Anophelines is most unusual in Sierra Leone even at the height of the dry season, and the probable explanation is the limited amount of fresh water to be found in the vicinity of the camp at that time of the year. There were

no springs or streams near and all water was obtained from wells. Culicines were numerous in the swamps on the periphery of the Island, and their larvae were found in the numerous crab-holes, but larvae were not found in those with a salinity above 1·9 per cent. During a brief survey made at the height of the rains in August 1931, larvae of *A. gambiae* were numerous in one of the marshes and in the many borrow pits. The same species was abundant in both native and European dwellings. Dissection of 90 individuals captured in sleeping quarters revealed a malaria infection rate of 13·5 per cent. The salinity of one spot in the marsh where no larvae had previously been found was reduced from 2·9 to 0·18 per cent. and larvae were breeding freely.

Hindle (E.). **An Attempt to demonstrate Residual Virus in Monkeys which had recovered from Yellow Fever.**—*Brit. J. Exptl. Path.*, xiii, no. 2, pp. 135–140, 7 refs. London, 1932.

In the course of this work, experiments were undertaken to determine whether the multiplication of the yellow fever virus in the body of *Aëdes aegypti*, L., could be used to detect its presence in the tissues of animals that had recovered from the disease. In preliminary tests, mosquitos fed on mixtures of yellow fever virus and honey became infective by bite after the usual incubation period of 9–12 days (at 28°C. [82·4°F.]) even when the food material had only been taken into the diverticulum [*cf. R.A.E.*, B, xix, 106]. In three experiments in which mosquitos were fed on suspensions of tissues of immune animals and after a suitable interval were allowed to bite, or were inoculated into, a normal monkey [*Macacus rhesus*], the results were negative. As the development of the virus in the mosquitos might have been prevented by the simultaneous ingestion of immune bodies, two further experiments were undertaken in which mosquitos were fed on a mixture of virus and immune serum with a little honey. Negative results were again obtained when these mosquitos were fed on or inoculated into normal monkeys [*cf.* xix, 110], thus indicating that a certain amount of immune serum prevents the virus from becoming established in the body of the mosquito. It is therefore probable that immune bodies would also prevent the establishment of any virus present in suspensions of tissues from animals that had recovered.

Hindle (E.). **Yellow Fever: Some recent Advances.**—*Trop. Dis. Bull.*, xxx, no. 5, pp. 278–290, many refs. London, May 1933.

This review of recent literature on various aspects of the problem of yellow fever includes a section on research connected with its transmission by *Aëdes aegypti*, L., and a summary of the results of experimental attempts to transmit it by means of other mosquitos and blood-sucking Rhynchota.

Broquet (C.). **Les accords internationaux conclus et projetés concernant les mesures à prendre en cas d'épidémie de dengue.—Communication au 1er Congrès international d'Hygiène Méditerranéenne, Marseille, 20–25 Septembre 1932.** (Abstr. in *Bull mens. Off. int. Hyg. publ.*, xxv, fasc. 4, pp. 698–699, 2 refs. Paris, April 1933.)

A project put forward by the Permanent Committee of the International Office of Public Hygiene in 1929 has led to a number of separate agreements between countries of the eastern Mediterranean

seaboard concerning measures to be taken in case of epidemics of dengue. These agreements are based on the articles dealing with yellow fever in the International Sanitary Convention of 1926, which assume 200 metres [220 yards] as the limit of flight of *Aëdes aegypti*, L. The author points out, however, that in many ports, notably river-ports, such as Saigon and Haiphong in Indo-China, where dengue and its vector are abundant, it would be impossible to maintain even this distance between a ship and the shore, and therefore useless to confine crews to their ships. It is thus urgently necessary to consider measures to be adopted where the transmission of infection between ship and shore cannot be prevented by isolation. Attention should also be given to the provisions dealing with yellow fever in the International Sanitary Convention for Air Navigation of 29th April 1932.

Nicolle (C.), Laigret (J.) & Sicard (M.). **Sur deux nouveaux cas de fièvre récurrente hispano-africaine observés en Tunisie (Cap Bon).** —*Arch. Inst. Pasteur Tunis.*, xxi, no. 3, pp. 401–411, 4 figs., 1 map, 3 refs. Tunis, 1933.

An account is given of two further cases of relapsing fever [*cf. R.A.E.*, B, xx, 247] in northern Tunisia (region of Cap Bon). Spirochaetes were observed in blood slides from both cases, but only those from one case could be studied. The behaviour of this strain in laboratory animals showed that it belonged to the group of *Spirochaeta hispanica.* It was easily transmitted from guineapig to guineapig by means of reared nymphs of *Ornithodorus erraticus*, Lucas. Lice [*Pediculus humanus*, L.] from one of the cases showed no spirochaetes, and a suspension of them inoculated into a healthy monkey (*Macacus rhesus*) gave negative results. On the other hand reared lice fed immediately after hatching on an infected monkey transmitted the disease to one out of two mice inoculated with a suspension of the mature lice 20 days later. The progeny of these infected lice were not infective either by bite or inoculation. Ticks collected in the region from which the cases had come were all *O. normandi*, Larr., with the exception of one male of *O. erraticus.* None was found to contain spirochaetes. These two ticks have already been found in association in Tunisia. In Spain and Morocco *O. erraticus* is the natural vector of relapsing fever due to spirochaetes of the group of *S. hispanica*, but up to the present it has only been found in Tunisia to carry *S. erratici*, a spirochaete that belongs to the group of *S. normandi*, which regularly infects *O. normandi* near Kef [xvi, 2, 161].

Wagner (J.) & [Vasil'ev] Wassilieff (A.). **Tableaux analytiques pour la détermination des puces rencontrées en Algérie et Tunisie (Manuel pour les médecins étudiant les maladies infectueuses des mammifères).**—*Arch. Inst. Pasteur Tunis*, xxi, no. 3, pp. 431–467, 44 figs., 28 refs. Tunis, 1933.

A key is given to the species of fleas occurring in Algeria and Tunisia, with notes on their hosts and distribution. A chronological list of the literature on north African fleas and notes on the collection and preservation of specimens are appended.

COLOMBANI (M.). **L'importance respective du rat et de la puce de l'homme dans les épidémies de peste au Maroc.**—*Bull. Soc. Path. exot.*, xxvi, no. 4, pp. 562–566, 8 refs. Paris, 1933.

In view of a tendency to construe Delanoë's remarks on the relative unimportance of rats and their fleas in the dissemination of an outbreak of plague in Morocco [*R.A.E.*, B, xxi, 31] to mean that removal of fleas from man and his environment should entirely replace the destruction of rats, the author points out that though, in an actual outbreak of plague, rats and their fleas may play a subsidiary part, they are nearly always responsible for the conservation of the bacillus and for its wide distribution.

In discussing the paper, Roubaud states that the short duration of plague epidemics in Morocco appears to be related to the short period during which *Pulex irritans*, L., remains infective.

MOUTOUSSIS (C.). **Recherches sur l'anophélisme et le paludisme en Grèce.**—*Bull. Soc. Path. exot.*, xxvi, no. 4, pp. 584–590, 2 refs. Paris, 1933.

Previous investigations have shown that in regions in Greece where malaria is severe *Anopheles sacharovi*, Favr (*elutus*, Edw.) is found in addition to *A. maculipennis*, Mg., and *A. superpictus*, Grassi [*cf. R.A.E.*, B, xix, 133 ; xx, 74, 264]. In a locality where there are two settlements of refugees among whom the disease is widely spread (spleen rate 95 per cent.), Anophelines taken in June–August comprised 286 *A. maculipennis*, 687 *A. sacharovi* and 262 *A. superpictus*, and dissection of 110 of each of the species showed 0·9, 5·4, and 2·7 per cent. respectively to be infective. In other localities where only *A. maculipennis* is found, the infection rate in 110 individuals during July and August, when there was an epidemic of malaria, was 1·8 per cent. In still other localities where malaria transmission is due solely to *A. superpictus* (refugee settlements near Athens) the sporozoite index of Anophelines caught in October and November 1930 was 6·2 per cent. This high rate was probably due partly to the large amount of malaria present at that season and partly to the fact that the emergence of new mosquitos had diminished considerably and there were consequently few young individuals in the bedrooms. It thus appears that *A. superpictus* and *A. sacharovi* are of particular importance in the transmission of malaria in Greece. In 1931, when there was a widespread outbreak of the disease, the numbers of these species and of *A. maculipennis* were high, whereas in 1932, when the incidence was low, they were much less abundant. There is, however, no relation between the numbers of the other species occurring in the regions observed, *viz. A. algeriensis*, Theo., *A. hyrcanus*, Pall., *A. hyrcanus* var. *pseudopictus*, Grassi, and *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) and the amount of malaria, and it is thought that their importance as vectors is negligible. Adults of *A. maculipennis* appear about the beginning of May, reach their maximum in June and July and decrease considerably during August and September, sometimes disappearing completely ; they reappear in small numbers in October and November. *A. sacharovi* develops at about the same time but is more stable and is present until August or September. *A. superpictus* does not appear till about July, and it occurs in maximum numbers in August and September and sometimes even October.

The wide distribution of *A. sacharovi* in Greece, its correlation with malaria in certain localities, its presence in large numbers in bedrooms, its exceptional multiplication in the summer and autumn of the epidemic year of 1931, its high rate of infection, and, finally, the observation that it is frequently found in localities where malaria is particularly severe in type show the necessity for a particular study of this species. As failure to observe its large numbers may have been due in the past to its confusion with *A. maculipennis*, the distinguishing characters are briefly described. In Greece, it breeds in localities close to the sea, in the neighbourhood of salt marshes and at the mouths of rivers where fresh and salt waters mix. It has been found in water containing 1·7 per cent. salt, and in experiments in which the salt content was gradually increased it developed in water containing 2·5 per cent. The salt content of the sea along the coasts of Greece varies with the season and with proximity to the mouths of rivers, but is on the average 3 per cent. *A. sacharovi* has also been found in marshes formed by natural springs near the sea and in the central regions; these waters had a salt content of 0·6–2·2 per mille, but they were very hard, containing a large quantity of salts of calcium and magnesium. Thus the wide distribution of this mosquito is easily explained by the fact that Greece is surrounded by seas and numerous islands and that over much of the country the substrata are calcareous. *A. maculipennis* also occurs over a large part of the area where *A. sacharovi* is found, as well as in the central part of the country where there are pools and marshes formed by rain water, by fresh water from springs, by the irregularity of river beds, and by floods. Examination of the eggs of *A. maculipennis* showed them to be barred, with large floats, of the type of var. *messeae*, Falleroni. In Italy this type occurs in parts of the country free from malaria, whereas in Greece it was found in localities where malaria is prevalent and where no other species of Anopheline was present. Thus the author concludes that, in localities where only *A. maculipennis* exists, malaria is not due to the presence of particular races of this species, but to the possibility of such races becoming dangerous under local conditions. *A. superpictus* breeds chiefly in running waters, particularly the numerous streams. It is found chiefly in the plains, in hills and even in mountainous regions and wherever there are springs of fresh water. The fact that it breeds from July to October renders it even more dangerous, owing to its infection with *Plasmodium falciparum*, which causes the high malaria rate that occurs at this time of the year.

TOUMANOFF (C.). **Sur un premier essai d'acclimatation au Tonkin de *Girardinus guppyi*. Remarques sur le facteur thermique de l'activité larvicide de ce poisson.**—*Bull. Soc. Path. exot.*, xxvi no. 4, pp. 632–638, 2 refs. Paris, 1933.

Details are given of the rearing in the laboratory at Tonkin of *Girardinus guppyi*, a fish imported from France with a view to its establishment for the destruction of Anopheline larvae. It was found that both in the laboratory and in pools exposed to the open air this species is capable of intensive reproduction under the climatic conditions of Tonkin. Experiments to determine the effect of temperature on its activity showed that the average number of larvae consumed daily varied, according to the size of the fish, from 3 to 17 at 16–20°C. [60·8–68°F.] and from 22 to 57 at 27–30°C. [80·6–86°F.]. The results

indicate that their activity will vary at different seasons of the year and that they will probably be most useful during the summer months, which coincide with the rainy season when the application of larvicides is most difficult. Moreover, the rapid development of mosquito larvae at this season would necessitate frequent treatments [*cf. R.A.E.*, B, xx, 62]. In experiments with indigenous larvivorous fish captured in the course of surveys at Tonkin, *Haplochilus javanicus* and *Macropodus cupanus* showed but slight activity during the cold weather in March, but small individuals of *Rasborichthys helfrichi* were more effective.

Raynal (J.) & Le Gac (P.). **Sur trois phlébotomes ♀ capturés dans les Pyrénées à Capvern et pouvant être rapportés à** *Phlebotomus ariasi* ♀.—*Bull. Soc. Path. exot.*, xxvi, no. 4, pp. 652–660, 3 figs., 3 refs. Paris, 1933.

A detailed description is given of three female sandflies belonging to one species that were taken at Capvern (Hautes-Pyrénées) in August 1932. They are believed to be those of *Phlebotomus ariasi*, Tonn. [*R.A.E.*, B, xix, 57], which was originally described from this region [ix, 88]. The characters distinguishing them from *P. perniciosus*, Newst., are given.

Sergent (Et.) & Trensz (F.). **Note préliminaire sur la morphologie des oeufs d'***Anopheles maculipennis* **de France et d'Algérie.**—*Arch. Inst. Pasteur Algérie*, xi, no. 1, pp. 9–11, 2 pls., 1 ref. Algiers, 1933.

An examination of the eggs of races of *A. maculipennis*, Mg., from a locality in the department of Corrèze, France, which is free from malaria, and from two malarious localities in Algeria, showed that they were light grey with irregular bands or spots and all belonged to var. *labranchiae*, Falleroni [*R.A.E.*, B, xv, 72].

Senevet (G.). **A propos des races d'***Anopheles maculipennis*.—*Arch. Inst. Pasteur Algérie*, xi, no. 1, pp. 12–14, 5 refs. Algiers, 1933.

A comparison of the males and larvae of *A. maculipennis*, Mg., from Dordogne, Algeria, and two localities in the Department of Corrèze on the basis of male genitalia and larval hairs [*cf. R.A.E.*, B, xviii, 228 ; xx, 119] showed that those from the last three localities are nearest to var. *atroparvus*, van Thiel, or var. *labranchiae*, Falleroni [see preceding paper], whereas those from Dordogne are allied to var. *messeae*, Falleroni.

Trensz (F.). **Sur une maladie microbienne des larves de** *Aëdes mariae*.—*Arch. Inst. Pasteur Algérie*, xi, no. 1, pp. 15–18, 1 fig., 2 refs. Algiers, 1933.

In the course of rearing *Aëdes mariae*, Serg., in Algeria in water of a salinity of 6 per mille, the authors observed among the larvae a bacterial disease characterised by the formation of small tufts

between the caudal hairs (and occasionally at the joints of the body segments). These growths, which retard development and cause a rather low mortality, are due to the association of two bacilli, which are described. The disease was experimentally reproduced by contagion or by infection with bacterial cultures. Larvae did not contract the disease in fresh water or in waters of salinities of 30 and 90 per mille.

KEMPER (H.). **Versuche über die Wirkung von Pyrethrumblütenpulver auf Tiere verschiedener Klassen mit besonderer Berücksichtigung der wasserbewohnenden Arten. Zugleich ein Beitrag zur Frage der Anwendbarkeit des Pulvers bei der Bekämpfung tierischer Schädlinge in Wasserversorgungs- und Abwasserbeseitigungsanlagen.** [Investigations on the Effect of the Powder of Pyrethrum Flowers on Animals of different Classes with special Reference to aquatic Species. Also a Contribution to the Question of the Applicability of the Powder for the Control of animal Pests in Water-supply and Drainage Systems.]—*Z. GesundhTech. u. Städtehyg.*, xxv, no. 3, pp. 149–164, 18 refs. Berlin, March 1933.

An account is given of laboratory experiments in Germany to determine whether pyrethrum powder can affect fish living in reservoirs containing drainage water, if it is used to treat the water in them or in the water-supply systems to destroy various pests. The toxic effect of pyrethrum on vertebrate animals and insects is reviewed from the literature [*R.A.E.*, A, xix, 726; xx, 442; B, xvii, 179; xviii, 58, 252; xx, 110, etc.], and a table is given showing the range of the dosages of the proprietary powder used by the author that were injurious or harmless to different fish and the number of hours in which the fish either were killed or recovered. It was found that fish paralysed by high dosages of the poison eventually recover when transferred to fresh water. Fish placed in containers in which the water had been treated 3 or 4 days previously were not affected, which indicates that a suspension of pyrethrum powder loses much of its toxicity in a few days. Tests with filtered suspensions showed that pyrethrin is liberated in water very quickly and mostly in colloidal form [*cf.* next paper].

The behaviour of aquatic insects in water treated with pyrethrum powder was similar to that of fish, and paralysed individuals transferred to clean water recovered. Observations on the effect of the powder on various Arthropods, molluscs, worms and rotifers, details of which are given, confirmed the suggestion that pyrethrum powder is primarily a nerve poison; protozoa remained unaffected owing to the absence of a nervous system. The thickness of the skin plays an important part in susceptibility, as some of the organisms have a skin more permeable to the colloidal particles present in water.

The author concludes that the highest dosages of pyrethrum powder can be used in sewage plants without fear of any injury being caused to the micro-organisms concerned in sewage purification [*cf.* xx, 111]. Treated drainage water, provided that it does not contain more than 5 mg. powder per litre, will not kill fish, and the latter can recover from its effect by passing into zones of clean water. If, however, the pyrethrum powder is to be applied in a water-supply system, the treated water should not be used for drinking purposes, or in swimming pools, aquariums, etc.

BUCHMANN (W.). **Untersuchungen über die Teilchengrösse der wirksamen Substanz von wässrigen Pyrethrum-Insektenpulver-Suspensionen.** [Investigations on the Size of the Particles of the active Material in aqueous Suspensions of Pyrethrum Insecticides.] *Z. angew. Ent.*, xx, no. 1, pp. 136–149, 19 refs. Berlin, April 1933.

In connection with the use of pyrethrum powder against larvae of Chironomids and mosquitos in sewage plants in Germany [*R.A.E.*, B, xx, 110], the author investigated the question whether pyrethrin, the active principle, goes into solution in water or, if it is merely suspended in it, the size of the particles that are capable of producing a toxic effect, as this would enable conclusions to be drawn regarding the distribution of the pyrethrum powder in the water to be treated. It was found that pyrethrin was poisonous to animal life (the Isopod, *Asellus aquaticus*) even when the pyrethrum powder was present at the rate of only 1 part in a million. A series of filtration experiments showed that the particles of pyrethrin occur in water in high colloidal division close to the limit between the colloidal and molecular conditions. The toxicity of the suspension was not appreciably decreased by filtering, unless particles of 0·005–0·01 μ were excluded. The practical conclusion drawn is that 2 mgm. pyrethrum powder per litre for *Asellus* and 3–4 mgm. for mosquito and Chironomid larvae are sufficient for effective control without contaminating the water. The powder need not be scattered on the water ; all that is necessary is to pour in a suspension passed through a cloth filter.

HECHT (O.). **Experimentelle Beiträge zur Biologie der Stechmücken III. Blutverdauung und Eireifung bei** *Anopheles maculipennis* **am Ende der Ueberwinterung.** [Experimental Contributions to the Biology of Mosquitos III. The Digestion of Blood and the Maturation of Eggs in *A. maculipennis* at the End of Overwintering.]—*Z. angew. Ent.*, xx, no. 1, pp. 126–135, 1 fig., 1 ref. Berlin, April 1933.

Details are given of further investigations on the effect of temperature on hibernating females of *Anopheles maculipennis*, Mg. [*cf. R.A.E.*, B, xxi, 75], with special reference to the end of the hibernation period and to the races that lay light-grey or dark eggs. In one series of tests females taken from Friedrichsmoor and the island of Neuwerk [xxi, 115] in mid-December were kept in an unheated greenhouse till the end of March and then transferred to a warm room and given a blood meal. Of those subsequently kept at temperatures of 25°C. [77°F.], 20–22°C. [68–71·6°F.] and 28–30°C. [82·4–86°F.], the majority oviposited. Those kept at 10°C. [50°F.], however, did not show any notable egg-growth, though the blood had been digested, but a development of the fat-body occurred. Similar experiments with mosquitos collected in Loppersum near Emden and again in Friedrichsmoor on the 10th and 30th March respectively, showed that at this period most of the females lay eggs after a single blood meal at mean temperatures of 28°C. and 20°C., and that at 10°C. the eggs become almost or completely mature. The fat-body development, when present, was slight, and in the majority of cases the digestive tract was empty. It was also found that the exposure to cold, to which mosquitos from Loppersum had been subjected (including a week at —7°C. [19·4°F.]), did not affect the maturation of the eggs. An increase in temperature accelerated their maturation.

The author contrasts the results of these experiments with those obtained in winter or at the beginning of hibernation [xxi, 75]. No appreciable difference was noticed in the behaviour of the races having light-grey or dark eggs.

In further experiments with mosquitos from the Emden region, where the race having grey eggs is almost the only form [xxi, 115], maturation of the eggs and oviposition were again observed after a single blood meal in the majority of cases; notable egg-growth and formation of the fat-body was especially marked in females that were subsequently fed on sugar-water.

HECHT (O.). **Experimentelle Beiträge zur Biologie der Stechmücken IV.** [Experimental Contributions to the Biology of Mosquitos, IV.]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 5, pp. 256–271, 19 refs. Leipzig, May 1933.

Since in the experiments at the end of March [see preceding paper], some individuals of *Anopheles maculipennis*, Mg., failed to show any notable development of the ova after a single blood meal, further investigations were made near Hamburg in June–August to determine whether a certain percentage of the females require repeated meals even in summer to induce the maturation of the eggs [*cf. R.A.E.*, B, xx, 58]. Mosquitos of the race producing dark eggs were captured in the district, and those having grey eggs were reared in the laboratory or taken from near Emden. The former were of the long-winged type, and the latter corresponded to the short-winged var. *atroparvus*, van Thiel. The temperatures to which they were subjected varied from 10 to 30°C. [50–86°F.]. The vast majority of the females of both races either oviposited or showed a marked development of the eggs after a single blood meal, the few cases of non-development being usually observed at the extremes of temperature. Supplementary feeding on sugar solution stimulated the development of the fat-body, but, contrary to its effect in the spring, did not apparently affect the maturation of eggs.

The second part of the paper deals with observations in November on the utilisation of the ingested blood in winter. The experiments were similar to previous ones [xxi, 75], but were conducted separately for each of the two races. None of the females of the race that produces light-grey eggs showed any notable egg-growth after 1 or 2 blood meals when kept at temperatures of about 22°C. [71·6°F.], 15°C. [59°F.], or 10°C. [50°F.], but a marked fat-body development was observed. Of individuals that were kept at 28°C. [82·4°F.] and had fed twice, only two oviposited and two more contained almost mature eggs. These results confirmed with regard to this race those obtained when the two races were not separated and also indicated that, if the temperature is high, a reduction may occur in the "gonotrophic dissociation" [xviii, 53] that in nature is a biological character peculiar to the race. The condition of semi-hibernation, when a sporadic production of eggs is possible during the winter, may also occur, though usually the ingested blood is not utilised for the development of the ovary, in spite of the relative activity of these mosquitos in houses and stables throughout the winter [xx, 212].

Females of the race having dark eggs were fed forcibly by the method of Fülleborn [xx, 108], which is described, since they do not feed during the hibernation period [xviii, 53]. The experiments

showed that in this race also the development of the ova proceeds very slowly in winter, and only at higher temperatures, the ingested blood not being utilised for egg-growth, so that a "gonotrophic dissociation" is present physiologically, though biologically of no importance. This seems to contradict the statement of Roubaud that with some strains of *A. maculipennis* the suspension of oviposition is solely due to, and may be induced by, the influence of cold [xx, 213]. The author points out that in the case of the race with dark eggs, the cessation of oviposition in winter is primarily secured by the hibernation of the mosquitos in comparatively cool shelters, which induces fasting, but that it differs physiologically from the race producing grey eggs in that it does not feed in winter; he therefore disagrees with the statement [xxi, 115] that the differences in the winter activity of the two races are largely a consequence of the different microclimates of the winter quarters they select.

de Buck (A.), v. d. Torren (G.) & Swellengrebel (N. H.). **Report for the Year 1932 on Investigations into the racial Composition of** *Anopheles maculipennis* **in Holland.**—*Riv. Malariol.*, xii, no. 2, pp. 265–280, 4 pls., 1 diagr., 7 refs. Rome, 1933.

A summary is given of all the characters, both morphological and biological, that have been considered to distinguish in some measure the short-winged and long-winged races of *Anopheles maculipennis*, Mg., in Holland [*cf. R.A.E.*, B, xxi, 139; etc.], showing the value of each by the percentage of cases in which it holds good. It is by means of these characters that the racial composition of *A. maculipennis* over the greater part of Holland has been determined. The pattern of the dorsal surface of the egg, a character used by Martini, Missiroli and Hackett [xx, 211], has been found to differ in the two races, the patterns on the eggs of the short-winged and long-winged races corresponding to those of the eggs of the Italian vars. *labranchiae* and *messeae*, Falleroni, respectively [xxi, 137]. Moreover, this character is shown to be more reliable than other morphological characters and can be compared favourably with the most significant of the biological ones. The structure of the eggs is further discussed. The difference in the relative lengths of the egg floats does not appear to be as great in Holland as in Italy, and the authors point out that the difference in the number of ribs on the floats, which has been used by them for 4 years, seems to be a more reliable character. Differences in the fans (palmate hairs) [xx, 119] are discussed, and it is pointed out that variations in their mode of pigmentation may also be useful in some cases. Further attempts to obtain pairing of the long-winged race in confinement were again unsuccessful even in large cages [*cf.* xx, 194], and the authors suggest that possibly the long-winged races from Spain (Murcia) and Italy (Pontine marshes) used by Roubaud [xx, 213] are not identical with the race in Holland. It has now been found that in the case of long-winged females differences in blood digestion [xx, 194] are only constant if the mosquitos are freshly collected before 31st December from their winter shelters, or at least have been kept fasting in the laboratory at low temperatures. Roubaud's assertion that females of the long-winged race can be induced to oviposit in winter by raising the temperature [xx, 213] was confirmed in an experiment in which 12 out of 84 females showed

development of the ova in November and December when kept at a temperature of 25–27°C. [77–80·6°F.]. Three females deposited eggs and others might have done so but for the heavy mortality that always occurs when the long-winged race is forced to feed in winter. Females of the short-winged race were also induced to oviposit in November and December under experimental conditions of intensive feeding and high temperature, 12 out of 57 showing mature eggs and 4 ovipositing. The rate appears even higher than in the long-winged race, but on the other hand the mortality was lower in the short-winged race, which is accustomed to feeding in winter. It is possible that the factors inhibiting ovulation would be more active in both cases in September and October.

HINMAN (E. H.). **The Use of Insects and other Arthropods in Medicine.**—*J. Trop. Med. Hyg.*, xxxvi, no. 9, pp. 128–134, 17 refs. London, 1st May 1933.

This is a brief review from the literature of the use of Arthropods in the treatment of osteomyelitis and (by induced fevers) of paresis, and as sources of materia medica and immune preparations. To test the theory that secretions of the salivary glands of certain insects have a chemotropic effect on microfilariae [*R.A.E.*, B, xx, 169], an effect that might be turned to account in xenodiagnosis [*cf.* iii, 56], the author conducted experiments on a dog infected with *Filaria* (*Dirofilaria*) *immitis*. Having made counts of the numbers of microfilariae in a known quantity of its blood, he injected a saline solution estimated to contain the equivalent of the salivary glands of two newly-emerged females of *Culex fatigans*, Wied. (*quinquefasciatus*, Say). Subsequent examination of blood samples from the site of the injection showed no significant increase of microfilariae, and it could not be established under the microscope that they were attracted by the solution. Five mosquitos simultaneously and on the same site ingested blood-meals of slightly less than 1 cu. mm. each from a dog estimated to contain 6·6 microfilariae per cu. mm. of blood. Of these, 3 were afterwards found to contain 5–9 microfilariae each, while the other 2 contained 26 and 32 respectively. More conclusive results are hoped for from future experiments.

ROBINSON (W.). **The Use of Blowfly Maggots in the Treatment of Osteomyelitis and certain other Diseases.**—*U.S. Dept. Agric. Bur. Ent.*, E–295, 2 pp. [Washington, D.C.] 1st March 1932.

ROBINSON (W.). **The Rearing of Blowflies and the Culture of sterile Maggots for Use in Osteomyelitis.**—*U.S. Dept. Agric. Bur. Ent.*, E–296, 8 pp., 12 refs. [Washington, D.C.] 9th March 1932. [Recd. May 1933.]

In the first paper a brief account is given of the use of larvae of *Lucilia sericata*, Mg., and *Phormia regina*, Mg., in the treatment of wounds in the United States [*cf. R.A.E.*, B, xx, 125–129]. The danger that would attend the use of larvae of *Cochliomyia macellaria*, F. (screw-worm fly) is pointed out.

The second paper includes notes on the life-history of the blow-fly and on practical methods of rearing [*cf.* xxi, 87–88, 120] and sterilisation. An incubator with direct passage of air rather than continuous circulation is recommended. A cage for adults [xxi, 34] is described.

Before sterilisation the eggs must be separated; Dakin's solution and sodium hypochloride solution have been used. For sterilising the eggs, G. F. White has recommended a solution of 0·25 gm. mercury bichloride, 6·5 gm. sodium chloride, 1·25 cc. hydrochloric acid and 250 cc. ethyl alcohol in 750 cc. water, and has also obtained good results with a 5 per cent. formalin solution. F. S. Child and E. F. Roberts have used a three-minute immersion in "a solution containing 4 per cent. formaldehyde." The sterilised eggs should be transferred to cheesecloth in a Gooch crucible, supported by a wide-mouthed bottle, and washed several times in sterile water. The larvae may be fed on cooked liver in nutrient agar and should be tested for sterility on the second day [xx, 125]. The technique of the wound treatment is described. The maggots must be changed every 5–6 days. The minimum period for a cure is 6–8 weeks.

Abbott (C. E.). **The Effect of Temperature and Relative Humidity upon the Olfactory Responses of Blowflies.**—*Psyche*, xxxix, no. 4, pp. 145–149, 1 fig, 1 graph, 10 refs. Cambridge, Mass., December 1932. [Recd. May 1933.]

It was found that *Lucilia sericata*, Mg., responded most readily to olfactory stimulation from ethyl butyrate at about 30°C. [86°F.], which the author concludes to be the optimum temperature for the metabolism of the species. At that temperature the optimum humidity was about 73 per cent.

Pearson (A. M.) & Richardson (C. H.). **The relative Toxicity of Trisodium Arsenite and Arsenious Acid to the House Fly, *Musca domestica* L.**—*J. Econ. Ent.*, xxvi, no. 2, pp. 486–493, 13 refs. Geneva, N.Y., April 1933.

The following is the authors' abstract: Solutions of arsenious acid and trisodium arsenite of various pH values were fed quantitatively to newly-emerged adults of *Musca domestica*, L. The solutions contained 15 grams of sucrose per 100 cc. Under these conditions the toxicity of arsenious acid (pH 6·58 to 6·96) was indistinct from that of trisodium arsenite (pH 11·3 to 11·4), possibly the result of buffer action within the digestive tract. The median lethal dose for the two forms of trivalent arsenic was 0·14 mg. arsenic per gram of body weight, a comparatively large median lethal dose for an insect. Arsenious acid solutions were not repellent at any arsenic or hydrogen-ion concentration used; trisodium arsenite solutions of equivalent As concentration were not repellent at pH 11·3 and 11·4, but were distinctly repellent at higher pH values. In practice, no more alkali should be added to baits for *M. domestica* than is necessary to hold the trivalent arsenic in solution.

Alderson (A. F.). **A Practical Test of the Lethal Action of Steam and Formalin Vapour on Spore-bearing Organisms and Bugs.**—*J. Roy. Army Med. Cps.*, lx, no. 5, pp. 374–376, 1 diagr. London, May 1933.

This paper includes a brief account of an experiment undertaken to determine the toxicity of formalin-impregnated vapour to bed-bugs

[*Cimex*]. A number of well fed individuals were placed in test tubes, the tops of which were covered with gauze, in the top and bottom corners of a room of 2,934 cu. ft. air space. A mixture of 1 gal. water and 50 cc. formalin was left boiling and the room sealed. After an hour during which the water had been boiling continuously, all the bed-bugs were dead.

Papers noticed by Title only.

Werneck (F. L.). **Considerações sobre o Genero *Phthirpedicinus* e sua Especie typo.** [Observations on the Genus *Phthirpedicinus* and on its Type Species (*P. microps*, Nitzsch).]—*Ann. Acad. bras. Sci.*, iv, no. 4, pp. 161–164, 2 pls. Rio de Janeiro, 1932.

Werneck (F. L.). **Sobre as Especies do Genero *Pedicinus*.** [On the Species of the Genus *Pedicinus*.]—*Ann. Acad. bras. Sci.*, iv, no. 4, pp. 179–184, 2 pls. Rio de Janeiro, 1932.

Werneck (F. L.). **Sobre as especies de Anoplura parasitas da lhama.** [On the Species of Anoplura (*Microthoracius praelongiceps*, Neum. and *M. mazzai*, Werneck) parasitising the Llama in Argentina.]—*Mem. Inst. Oswaldo Cruz*, xxvii, no. 1, pp. 21–32, 15 figs. Rio de Janeiro, March 1933. [*Cf. R.A.E.*, B, xxi, 112.]

Hassall (A.) & Potter (M.). **Index-catalogue of Medical and Veterinary Zoology. Part I. Authors: AALL to AZZOLINA.**—pp. 1–142. Washington, D.C., U.S. Dept. Agric., 1932. [Recd. June 1933.]

Matheson (R.). **The Utilization of Aquatic Plants as Aids in Mosquito Control.**—*Smithson. Rep. 1931*, pp. 413–430, 7 pls., 3 pp. refs. (Publ. 3158). Washington, D.C., 1932. [Recd. May 1933.] [See *R.A.E.*, B, xviii, 68.]

Campbell (F. L.), Sullivan (W. N.) & Smith (C. R.). **The relative Toxicity of Nicotine, Anabasine, Methyl Anabasine and Lupinine for Culicine Mosquito Larvae.**—*J. Econ. Ent.*, xxvi, no. 2, pp. 500–509, 1 graph, 6 refs. Geneva, N.Y., April 1933. [See *R.A.E.*, A, xxi, 342.]

Kemper (H.). **Ueber die Bekämpfung der Schmetterlingsmücke *Psychoda* auf Tropfkörperanlagen.** [On the Control of the Moth-fly, *Psychoda*, in trickling Sewage Filters. (A review of the literature.)]—*Z. GesundhTech. u. Städtehyg.*, xxv, no. 5, pp. 283–288, 20 refs. Berlin, May 1933.

Wagner (J.). **Aphanipteren-Material aus der Sammlung des Zoologischen Museum der Berliner Universität.** [Siphonaptera from the Collection of the Zoological Museum of Berlin University (with 2 new genera and 7 new species).]—*Mitt. zool. Mus. Berlin*, xviii, no. 3, pp. 338–362, 21 figs. Berlin, April 1933.

Rondelli (M. T.). ***Ixodes nivalis* n. sp. una nuova zecca italiana parassita su *Chionomys nivalis*.**—*Il Parco naz. d. Gran Paradiso*, ii, pp. 85–86, 5 figs., 2 refs. Torino [1927]. [Recd. June 1933.]

Missiroli (A.), Hackett (L. W.) & Martini (E.). **Le razze di *Anopheles maculipennis* e la loro importanza nella distribuzione della malaria in alcune regioni d'Europa.** [The Races of *A. maculipennis* and their Importance in the Distribution of Malaria in some Regions of Europe.]—*Riv. Malariol.*, xii, no. 1, pp. 1–56, 12 figs., 6 graphs, 1 pl. Rome, 1933. (With Summaries in Italian p. 252, French p. 254, English p. 258, German p. 261.)

This paper opens with a review of the published investigations to March 1933 made in Italy, France, Holland and Germany on the races of *Anopheles maculipennis*, Mg. On the basis of the eggs, which are described and figured, the authors recognise 5 races, *viz.*, the typical *maculipennis*, with its varieties *messeae*, Falleroni, *atroparvus*, van Thiel, and *labranchiae*, Fall., and *A. sacharovi*, Favr (*elutus*, Edw.), which they regard as a member of the racial complex.

Of these, var. *messeae* prefers the fresh, clear water of lakes and river valleys and generally standing or slow-moving waters of the plains of the region from the North Sea to the north of Central Italy. In some parts of North Italy it is almost the only Anopheline present. The typical *maculipennis* is found in fresh water, either clear or not, in the plains and in the mountains (Black Forest and region of the dried Lake of Fucino), in fresh spring water (Mundenhof, Wohldorf), or in stagnant water below sea-level (Portogruaro in North Italy). It is not particular in its choice of breeding-places and is the most widely distributed form in Europe, occurring from Norway to Greece. These two races are the predominant ones in Europe. Var. *atroparvus* is the race characteristic of low-lying countries, along the sea and in reclaimed marshland. In Holland, Germany and Italy (delta of the Po) it occurs in areas below sea-level. It is found also on the North Sea islands, and, mixed with other races, in some inland places near brackish springs. It may therefore be regarded as the race of brackish water in northern Europe and of the peaty waters in reclaimed areas in North Italy. Slight changes in its breeding-places can cause its disappearance in competition with the more ubiquitous races. The Anophelines of South Italy that have been classed as var. *atroparvus* (which lays brown spotted eggs) are probably var. *labranchiae* (laying grey spotted eggs). The latter breeds in brackish water in marshy areas along the coast of Central and South Italy and of the Italian islands. Inland some unmixed populations occur also in fresh water, as in Sicily. The chief factor appears to be a climate of tropical character, which is not so much favourable to this variety as unfavourable to the northern ones with dark, banded eggs. *A. sacharovi* is the brackish water race of southern Europe ; in Palestine it breeds in fresh water. It can tolerate up to 20 per cent. salinity, which the other forms cannot do.

The biological differences between these races are also discussed. The typical *maculipennis* is always associated with cattle throughout its area of distribution, so that environment has not influenced its biology. As it bites man only exceptionally, it is not usually connected with endemic malaria. Var. *messeae* is also closely associated with cattle, but in certain conditions (scarcity of cattle, moisture, heat, etc.), it bites man and can maintain a slight degree of endemic malaria. Var. *atroparvus* has food-preferences similar to those of *messeae* and is responsible for slight endemic malaria in small areas in Holland and Germany. The post-war epidemics have, however, died down rapidly. In southern Europe, both *labranchiae* and, in a greater measure,

sacharovi, are associated with cattle and man and bite in all environments. Their presence implies endemic malaria of more or less severity. They usually attack man indoors, but may also do so in the open.

The authors do not consider the hypothesis advanced by Dutch workers [*R.A.E.*, B, xv, 145; xviii, 52] necessary to explain the occurrence of malaria in Holland, but do not discuss it. They report on differences in behaviour during hibernation merely to provide an additional differential racial character. Their investigations in this connection were made in November and December 1932 in Italy, the results being shown in a table and graphs. In *messeae* the ovarian function was suspended at the end of October, few individuals contained blood and in most of them the fat-body was well developed. In November females containing blood were taken in animal quarters, but in the second half of December these were abandoned and the mosquitos were found in cold places such as lofts, cellars and unoccupied rooms. Here they occurred unmixed, but in March 1933 they were found in stables with *atroparvus*. The typical *maculipennis* had the same hibernation characteristics, except in a warmer region, Orti di Schito, near Naples. It is deduced that while temperature is not the sole factor in hibernation it nevertheless has a marked influence, at least for certain races. At Schito the females continued feeding and maturing their eggs, and in the second half of December a considerable percentage contained blood and a few had eggs in course of development. The mosquitos also remained in animal quarters. The hibernation characters of *atroparvus* and *labranchiae* were very similar. They hibernated in places occupied by man and animals and continued feeding. Ovarian activity ceased completely in *atroparvus* early in November and occurred only in a few females of *labranchiae*. More than half the individuals of both races had a scanty development of the fat-body. Except that in Germany the transition from summer to winter life occurs earlier than elsewhere, *atroparvus* behaves south of the Alps in the same manner as in the coastal region of Holland and Germany where it is the predominant race.

Supplementing the authors' investigations, La Face sought to ascertain if temperature had the same influence on ovarian activity in the different races. Mosquitos taken in Italy in late autumn were kept at a temperature of 26–27°C. [78·8–80·6°F.]. Females of *labranchiae* deposited many grey spotted eggs, and a single oviposition of dark eggs was also observed. Those of *atroparvus* had numerous ovipositions of typical brown spotted eggs that developed regularly. On the other hand, *messeae* showed marked inertia; only after one month was a deposition of dark, banded eggs observed, and none of these hatched. Only two ovipositions were obtained from typical *maculipennis*. These physiological differences confirm the division into races.

The authors record data obtained in Italy on the morphological differences in wing-length and number of maxillary teeth, but point out that these are not comparable with those in northern Europe, as the mosquitos decrease in size southwards. They do not agree with Roubaud's view that mosquitos with few teeth attack man because they are ill-adapted to feed on cattle. Though *labranchiae*, which has a low maxillary index, attacks man, *sacharovi* does so to an even greater extent and had an index of 15·88 in some areas where malaria was severe. On an average there were no notable differences in wing-length for typical *maculipennis*, *atroparvus*, and *sacharovi*.

The average length for *labranchiae* was decidedly shorter (less than 4·2 mm.). The wing-length of *messeae* is 5·3–5·6 mm. in northern Europe and 4·4–4·5 in Italy. There is also a decrease in maxillary index from north to south.

The recorded differences in male hypopygial characters and in larval morphology are tabulated for *maculipennis, messeae, atroparvus* and *labranchiae*. It is concluded that morphological and biological characters distinctly separate *maculipennis* from *labranchiae*, but that the differences between *maculipennis* and *messeae* and especially between *labranchiae* and *atroparvus* are so slight as to render distinction difficult without the aid of the eggs.

Guided by the information recorded above, a re-examination was made of the position as regards malaria in a locality in Ferrara where La Face had worked in 1926 [*R.A.E.*, B, xiv, 216], and it is concluded that the numbers of *A. sacharovi* account for the persistence of the disease. The prevalence of *A. sacharovi* appears due to the high salt-content of the waters in the region. At Mantua, malaria had decreased in the early years of the present century, but increased immediately after the War. This is attributed to the immigration of large numbers of gametocyte carriers from malarious districts, as the Anophelines at Mantua are zoophilous and only bite man occasionally.

STRICKLAND (C.) & ROY (D. N.). **Malarial Infection of the Gut of *Anopheles stephensi* in Calcutta.**—*Riv. Malariol.*, xii, no. 1, pp. 57–69, 3 pls., 5 refs. Rome, 1933. (With Summaries in Italian p. 252, French p. 255, English p. 258, German p. 261.)

Following the discovery that in Calcutta the invasion of the salivary glands of *Anopheles stephensi*, List., by malarial sporozoites has a well-marked seasonal variation [*R.A.E.*, B, xxi, 78], observations were made on the relation of this variation to the earlier stages of the development of the parasite in the mosquito.

The following is based on the authors' summary: The gut infection rate of *A. stephensi* experimentally infected in Calcutta was higher than the gland rate in the "off season," whereas in the "infective" season the converse was the case. A small gametocyte density corresponded to a smaller proportion of gut to gland infections. In March, when the gland infection rate was nearly zero, it was found in 26 out of 67 gut infections that oöcysts contained sporozoites that did not emerge even after long periods of development (13–20 days), and it is suggested that they were either dead or imprisoned by the hardened tissues. The chitin bodies of Brug ("black spores") [*cf.* xxi, 77] had a marked seasonal incidence, increasing when the development of the parasite was becoming more active. This coincided with the onset of the rains. So far as Calcutta is concerned, Dr. H. P. Chaudhuri reported that the chitin bodies had a very significant positive relation with humidity and no significant relation with minimum or maximum temperatures. The authors found the chitin bodies to be associated with zygotes and oöcysts, and failed to observe them in mosquitos not fed on infected blood. They were found with *Plasmodium malariae*, *P. vivax*, and, predominantly, *P. falciparum*. The effect of drugs given to the human host on chitin-body formation in the mosquito was investigated. Treatment with atebrin caused a higher rate of chitin-body formation, but plasmochin did not cause any to appear in 63 cases (January and February). Microchemical tests of the bodies

showed the reactions of chitin, and the authors believe that they are produced by the deposition of chitin in the zygotes or oöcysts of the malarial parasite in the mosquito.

De Benedetti (A.). **Di un metodo per rendere praticamente insommergibili le polveri menstrui per lo spandimento del verde di Parigi.** [A Method for rendering practically unsinkable the Dust Carriers of Paris Green.]—*Riv. Malariol.*, xii, no. 1, pp. 92–97. Rome, 1933. (With Summaries in Italian p. 253, French p. 256, English p. 259, German p. 263.)

Owing to the difficulty in obtaining road-dust and the cost of French chalk, experiments were made at Milan to find a suitable carrier for Paris green applied as a dust against Anopheline larvae. After numerous tests, it was found that a satisfactory material that remains on the surface of the water can be obtained by mixing intimately a small quantity of mineral oil with any silicaceous or calcareous dust, except calcium sulphate, and then heating to evaporate the excess of oil. Common garden mould is considered to be the best for the purpose because it is cheap and easy to obtain. Mixing is readily effected in a concrete mixer and heating to 250°C. [482°F.] in a fixed or portable oven.

De Muro (P.). **Sulle diverse razze di *Anopheles maculipennis* nell'Agro Pontino.** [On the different Races of *A. maculipennis* in the Pontine Marshes.]—*Riv. Malariol.*, xii, no. 1, pp. 98–107, 27 refs. Rome, 1933. (With Summaries in Italian p. 253, French p. 256, English p. 259, German p. 263.)

A preliminary report is given of a study of the races of *Anopheles maculipennis*, Mg., in the Pontine Marshes. The race with grey eggs, var. *labranchiae*, Falleroni, was widespread, representing 68·1 per cent. of the Anophelines. In some localities it appeared to occur unmixed. It had a maxillary index of 12·79 and seems to be the chief vector of malaria in the interior of this region. The percentage of the race with dark eggs, var. *messeae*, Fall., was 17·1. Of 60 egg-batches obtained, 53 were from females from animal quarters and only 7 from females from dwellings, so that this variety appears to feed chiefly in the former. Its maxillary index was higher than that of var. *labranchiae*, and 38 out of 60 specimens had an index even higher than 14. Falleroni's variety with eggs with black cross bands [*R.A.E.*, B, xv, 71] was not common (6·8 per cent.) It was rare in dwellings, but more abundant in animal quarters. Its maxillary index was 14·1. In the coastal zone *A. sacharovi*, Favr (*elutus*, Edw.) appeared to be the chief vector of malaria. The few specimens examined had an index of 14·3.

Paladino-Blandini (A.). **Ordinamento e primi risultati della lotta antianofelica generale in Calabria.** [The Organisation and first Results of general anti-mosquito Work in Calabria.]—*Riv Malariol.*, xii, no. 1, pp. 118–195, 30 figs. Rome, 1933. (With Summaries in Italian p. 254, French p. 257, English p. 260, German p. 264.)

A description is given of the topography of Calabria, of which one-third is malarious, together with a report on work in 1926–28, preparatory to the initiation of a campaign against Anophelines.

For demonstration purposes stations were established for the use of Paris green, and *Gambusia holbrooki* was introduced. The general campaign was officially undertaken from 1928 to 1931, compulsory dusting with the larvicide being carried out by 11,000 landowners. The work reached practical efficiency in 1930, and the usual severe recrudescence of malaria at the end of summer and beginning of autumn did not occur in 1931. A note by A. Coglitore describes the methods used for sifting the road-dust and mixing it with 1 per cent. Paris green.

GIGLIOLI (G.). **Le reticelle di alluminio nella profilassi meccanica. Un esperimento sulla loro resistenza e durevolezza.** [Aluminium Gauze for Mosquito Screening. An Experiment testing its Strength and Durability.]—*Riv. Malariol.*, xii, no. 1, pp. 196–197. Rome, 1933. (With Summaries in Italian p. 254, French p. 257, English p. 260, German p. 264.)

Screens of aluminium gauze used in a locality in the interior of British Guiana under conditions of extreme humidity have remained in excellent condition for 8 years.

MYERS (J. G.). **Report on the Sand-fly** (*Culicoides*) **Investigations in the Bahamas.**—Typescript, 18 pp. 10 refs.

Ceratopogonid midges, which are serious pests in various coastal districts of Central America [*cf. R.A.E.*, B, xvi, 118], the United States [xx, 271] and the West Indies, have become of economic importance in New Providence and Hog Island (Bahamas) with their development as a holiday and residential centre. *Leptoconops* sp. and other species occurred rarely, almost all the nuisance being caused by *Culicoides furens*, Poey. In observations made in April-May 1932, it was found to breed in brackish swamps, especially in areas of waterlogged sand mixed with humus, not subject to actual flooding except by unusually high tides and more or less covered with a growth of mangroves. The temperature of the surface soil was 13–14°F. lower in the shade of the mangroves than under direct sunlight, where the larvae did not occur. They were also found in the shade of other vegetation, but not of the commonly occurring *Salicornia*. They lived and pupated in the soil of the swamp, and the adults usually emerged in the evening before 9 p.m. At least one blood-meal is required to fertilise the eggs, but almost any vertebrate may serve as a host. The females bite chiefly in evening and early morning and remain in shelter during windy weather. All infestations found were well within ½ mile of a favourable breeding-place. It is suggested, as a decisive control measure, that swamps within this distance of areas to be protected should be either filled in or dredged. If drainage channels are used, they should be kept straight-edged and clear of vegetation. A breeding-place might perhaps be destroyed simply by clearance of mangroves and other cover. Palliatives suggested include the use of cheese-cloth bed-nets, kerosene-pyrethrum sprays and chemical deterrents, of which oil of pennyroyal is recommended.

WASHBURN (B. E.). **An Epidemic of Malaria at Falmouth, Jamaica, British West Indies.**—*Amer. J. Hyg.*, xvii, no. 3, pp. 656–665, 3 maps. Baltimore, Md., May 1933.

Between June 1931 and February 1932 over 4,400 cases of malignant tertian malaria [*Plasmodium falciparum*], with 138 deaths, occurred in

a population of about 8,000 in the neighbourhood of Falmouth, northern Jamaica, in which malaria had not previously been a major health problem. An abnormally wet season in January-June 1931, following two years of low rainfall, greatly favoured the breeding of Anophelines, which, contrary to former observations, far outnumbered Culicines. Control measures adopted included filling of small pools, oiling, and dusting with Paris green. The most important, however, was the reopening and extending of a channel, which, by connecting with the sea a large permanent swamp near the town, reduced its area by half, besides making it markedly saline. This change was followed by a steady decrease in the numbers of larvae of *Anopheles albimanus*, Wied., the only known vector of malaria in Jamaica [*cf. R.A.E.*, B, xviii, 51 ; xix, 213], and an accompanying increase of *A. grabhami*, Theo. With the beginning of the dry season in December, mosquito breeding was greatly reduced, and after January no serious cases of the disease were reported.

Boyd (M. F.) & Stratman-Thomas (W. K.). **Studies on Benign Tertian Malaria. 2. The clinical Characteristics of the Disease in Relation to the Dosage of Sporozoites.**—*Amer. J. Hyg.*, xvii, no. 3, pp. 666–685, 1 ref. Baltimore, Md., May 1933.

In the course of infecting paretics in Florida with benign tertian malaria by means of Anophelines, using a technique previously described [*R.A.E.*, A, xxi, 73], a direct relation was found to exist between intensity of "quantitative infection" [*loc. cit.*] of the moquito used and the clinical characteristics of the resulting attack (success of inoculation, duration of primary attack and frequency of chills, and perhaps also rapidity of intrinsic incubation, occurrence of renewed attacks and preponderance of quotidian over tertian fever). Adults, particularly negroes, were often resistant to inoculation by mosquitos that had not matured a heavy infection. Most of the attacks were produced with a single strain of *Plasmodium vivax*, transmitted by *Anopheles quadrimaculatus*, Say ; exceptions included 5 successful inoculations by *A. crucians*, Wied., 1 by *A. punctipennis*, Say, and 1 by *A. walkeri*, Theo. [*cf.* xxi, 148]. In only one case, in which the patient developed a short self-limited attack after an incubation period of 23 days (the normal period in these studies being 10–20), were no sporozoites actually observed in the mosquito used, on its being dissected immediately after biting.

Boyd (M. F.) & Stratman-Thomas (W. K.). **A Note on the Transmission of Quartan Malaria by** *Anopheles quadrimaculatus*.—*Amer. J. Trop. Med.*, xiii, no. 3, pp. 265–271, 2 refs. Baltimore, Md., May 1933.

An account is given of experiments in Florida in which two strains of *Plasmodium malariae* [*cf. R.A.E.*, B, xx, 97, 256, etc.] were successfully transmitted to man by *Anopheles quadrimaculatus*, Say. The extrinsic incubation period at about 68°F. was as long as 30–35 days. The microgametocytes observed were not exactly as illustrated in standard works of reference.

GRIFFITTS (T. H. D.). **Air Traffic in Relation to Public Health.**—*Amer. J. Trop. Med.*, xiii, no. 3, pp. 283–290, 2 refs. Baltimore, Md., May 1933.

Further experiments are described on the transport of mosquitos by aircraft [*cf. R.A.E.*, B, xx, 51]. Of 840 stained individuals of *Aëdes aegypti*, L., liberated in 12 batches in all compartments of passenger aeroplanes before departure from San Salvador (Central America), 8 per cent. were recovered on arrival 30 hours later at Brownsville (Texas), having survived an average maximum elevation of 14,000 feet [*cf.* xx, 149]. Of 70 liberated in one aeroplane at San Salvador, 4 were recovered at Miami (Florida) after a journey of 79 hours, including 10 intermediate landings of which 3 were overnight stops. These and other experiments show that air transport may be a factor in the spread of mosquito-borne disease, though the importation of infected mosquitos is probably of secondary importance to that of infected men. The danger may be efficiently countered by proper surveillance of passengers and crews, anti-mosquito sanitation at airports and preventive and control measures on aeroplanes.

WATSON (Sir Malcolm). **Tropical Hygiene and Malaria Control on Mines at various Elevations.**—*Bull. Instn. Min. Metall.*, no. 340, 12 pp., 4 pls. London, January 1933.

After giving a brief general account of the history of research on malaria and the reasons why its transmission depends on the presence, within about ½ mile, of breeding-places of Anopheline vectors, the author discusses its incidence in tin mines in Malaya, which are situated up to 1,000 ft. above sea level, in iron mines in India between 500–2,000 ft., and in copper mines in Africa at 4,000 ft.

The tin mines in Malaya are found along the edge of the granite ranges, many of the rivers contain alluvial tin, and tin is found extensively in old river beds. Originally the mines were worked as opencast workings, but dredging has recently been introduced, and a considerable amount of hydraulic mining is also carried on. As the species of *Anopheles* that carry malaria usually breed in clean water, dredges situated in swamps coloured red by mine tailings are singularly free from the disease. The large opencast mines are also, as a rule, free from malaria. The most unhealthy mines are those found in the hills, where the vectors breed in the small streams. Hydraulic mines, where a whole hill may be washed away, are also often unhealthy, but in this case control may be obtained by oiling the breeding-places, which are not usually extensive. Mines away from the hills and in proximity to the alluvial plains in the zone where *Anopheles umbrosus*, Theo., occurs are very malarious. In such cases the mining camp should be situated ½ mile from the swamp in which mining operations are being carried out. This is a more satisfactory procedure than leaving dwellings on an unhealthy site and attempting to protect the miners by screening.

The most extensive iron mines in India are probably those along the edge of the high plateau that forms the bulk of southern India. The iron ore, which is often pure iron oxide, forms the hills and is quarried from them. In dry weather little water is seen, but in the monsoon season there are innumerable small springs in which malaria vectors breed. When these are controlled malaria disappears. In the copper mines of Northern Rhodesia and the Katanga District of the Belgian

Congo, malaria is transmitted by *Anopheles gambiae*, Giles, which breeds in pools in the sunshine and is particularly abundant during the wet season when the number of pools is greatest, and *Anopheles funestus*, Giles, which breeds in slowly moving water among grass where there is a certain amount of shade. *A. gambiae* may be dealt with by weekly application of oil to the pools, but to control *A. funestus*, which is most often found in swampy clearings in the bush, drainage is required. The necessity for medical officers to know something of entomology and engineering and for the layman to understand the malaria problem sufficiently to co-operate with them, is emphasised.

París Eguilaz (H.). **El peligro de la fiebre amarilla en los territorios españoles del Golfo de Guinea.** [The Danger of Yellow Fever in the Spanish Territories of the Gulf of Guinea.]—*Med. Países calidos*, vi, no. 3, pp. 196–201, 11 refs. Madrid, May 1933.

Cases of suspected yellow fever occurred in the island of Fernando Po in 1931. An epidemiological investigation is desirable, especially in view of the continuous immigration of labour from the mainland. In Spanish Guinea there is a further danger of the introduction of the disease by land routes. Various species of the genus *Aëdes*, including *A. argenteopunctatus*, Theo., are numerous.

Jack (R. W.). **The Tsetse Fly Problem in Southern Rhodesia.**—*Rhod. Agric. J.*, xxx, no. 5, pp. 365–384, 1 fldg. map; also as *Bull.* [*Minist. Min. Agric. Rhod.*], no. 892, 20 pp., 1 fldg. map. Salisbury, May 1933.

An account is given of the history of the distribution of *Glossina morsitans*, Westw., in Southern Rhodesia and of the measures that have been taken in recent years to check its advance and to reclaim valuable farming areas, most of which information has already been noticed [*cf. R.A.E.*, B, xviii, 204, 214; xix, 178; xx, 224; xxi, 28, etc.]. Possible alternative measures to the destruction of game as means of control are discussed, together with the reasons why they are not applicable under conditions in Southern Rhodesia [*cf.* xviii, 214].

Jack (R. W.). **Experiments with Tsetse Fly Traps against** *Glossina morsitans* **in Southern Rhodesia.**—*Rhod. Agric. J.*, xxx, no. 5, pp. 393–398; also as *Bull.* [*Minist. Min. Agric. Rhod.*], no. 893, 8 pp. Salisbury, May 1933.

A brief summary is given of data obtained in experiments with traps for *Glossina morsitans*, Westw., in Southern Rhodesia. In addition to the Harris trap [*R.A.E.*, B, xix, 78], others were used that were constructed on the principle of attracting the flies into a shady enclosure and then from the dark to a light portion of the trap. With all the models in the locality where the tests were made, the numbers of *G. morsitans* taken were greatly inferior to those of *G. pallidipes*, Aust., caught in the Harris trap in Zululand. The traps were more attractive in warm, dry weather (August, September and, to a less extent, October) than in either cool, dry weather (May–July) or in the wet season. In fact, during 9 months of the year the catches were more or less negligible. The substitution of dark blue or black cloth for the hessian, of which the first models were made, greatly increased the catches, and, on a screen, dark blue was more attractive than a range of other colours, including

khaki, which had previously been regarded as probably the most attractive. It also attracted considerably more flies than a live donkey. It has generally been considered that an oblong trap or screen attracts tsetse-flies because it more or less resembles an animal, but the author deduces from his experiments that the flies being shade-loving (sciaphilous) their reaction is to shade (sciatropism), whether it is actual shade or a dark coloured screen, which would presumably have the same appearance to the fly. It was found that flies were attracted strongly to moving men or vehicles under meteorological conditions that rendered the traps practically inoperative, which appears to be a sufficient proof that there is a difference in the attraction. Moreover, fully-fed flies were also caught in traps, and these could not have been seeking food.

Need for shade is more pronounced in some species than in others and seems to be correlated with the ability of a particular species to resist desiccating influences. *G. pallidipes* appears to require thickets in its habitat, and it occurs in some places in dense forest, which *G. morsitans* definitely avoids. The association of *G. pallidipes* with thicket indicates attraction to low patches of shade on a landscape, and these differ in appearance from the shade cast by trees in the open forest with which *G. morsitans* is associated. Thus it would seem that the relatively weak attraction of *G. morsitans* to the Harris trap when compared with *G. pallidipes* is due to the fact that the former requires less shade and shade of a different type. In either cool or wet weather, when the rate of evaporation is low and there is a super-abundance of shade in the forest, *G. morsitans* does not appear to seek shade readily, but when the evaporation rate increases and the shade in the forest is reduced by leaf-fall, the necessity for it becomes more urgent, and it is under these conditions that the traps are most effective. It would seem that as tsetse-flies are confined to the forest they must be guided in their flights by something that is also confined to it, and it is suggested that they consistently fly from one patch of shade to another. This habit is probably sufficient, even in cool, humid weather, to prevent *G. morsitans* from wandering far into the open, and under conditions of high evaporation, such as prevail during the latter part of the dry season, its ranging flights are probably strictly controlled by the occurrence of patches of shade in reasonably close proximity to one another.

There is little doubt, at least in the case of *G. morsitans*, that the primary visual hunger reaction from a distance is towards movement (kinetropism). It is usually a stronger attraction than shade to hungry flies and to non-hungry males, but appears to be in abeyance in the case of non-hungry females. Under conditions of an excessively high evaporation rate, such as occurs on hot days in October, the need for shade is stronger than the desire for food, and even hungry flies may fail to be attracted to moving objects. From short distances hungry flies are probably also attracted by scent. Although it should be comparatively easy to devise traps on the basis of movement that would catch large numbers of *G. morsitans*, it would hardly be possible, even when using wind as the source of power, to construct them cheaply. Moreover, for long periods in Southern Rhodesia sufficient wind would not occur. Finally the author points out that in this Colony there is one vast fly belt and that, to use traps effectively, areas would have to be artificially isolated ; practicable methods for accomplishing this have not yet been discovered. The prospect of bringing about retrogression

of the fly over a wide front by any form of trapping or even of arresting its general spread along a line of about 600 miles appears to be very slight.

GUNDRY (B. G.). **The Construction of Dipping Tanks.**—*Rhod. Agric. J.*, xxx, nos. 4–5, pp. 297–306, 404–413, 2 fldg. plans. Salisbury, Rhodesia, April & May 1933.

Details, including specifications and quantities of materials required, are given for the construction of tanks, either in concrete, masonry or brick, for dipping cattle against ticks, with a view to enabling farmers with some experience in building to carry out this somewhat specialised work themselves or to supervise contractors. General notes are given on such points as the selection of sites, the testing and calibrating of the tanks, and the erection of roofs and collecting and dripping pens. Advice on the drawing-up of contracts is appended.

SINCLAIR (J. M.). **Notes on the Management of Dipping Tanks.**—*Rhod. Agric. J.*, xxx, no. 5, pp. 413–422, 1 fig. Salisbury, Rhodesia, May 1933.

The method of maintaining the dipping fluid at the required concentration in the tank is described, together with the precautions necessary to prevent cattle being poisoned by the dip, and a table shows the dilutions of various proprietary dips that should be used to conform to the requirements of the Cattle Cleansing Ordinance in Southern Rhodesia [*R.A.E.*, B, vii, 42] *viz.*, a solution containing the equivalent of 0·16 per cent. arsenious oxide. Notes are given on the mixing of a sodium arsenite dip, on the need for avoiding wastage of dips and on the taking of samples for chemical analysis. The construction and use of a dredger for removing the sediment from the bottom of the tank is described.

IMES (M.). **The Sheep Tick and its Eradication by Dipping.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 798 (revd.), 22 pp., 14 figs. Washington, D.C., December 1932. [Recd. June 1933.]

The information in this bulletin is almost identical with that in a previous edition [*R.A.E.*, B, v, 145], but lime-sulphur dips are stated to be ineffective against *Melophagus ovinus*, L., on sheep, and the recommendation for the use of a combined lime-sulphur and arsenical dip is omitted.

ROBERTS (R. A.). **Additional Notes on Myiasis in Rabbits (Dipt.: Calliphoridae, Sarcophagidae).**—*Ent. News*, xliv, no. 6, pp. 157–159, 2 refs. Philadelphia, Pa., June 1933.

Two further instances [*cf. R.A.E.*, B, xx, 225], of infestation of wounds in hares (*Lepus californicus texianus*) by both *Cochliomyia macellaria*, F., and *Sarcophaga plinthopyga*, Wied., are recorded from Texas. In one case two examples of the Chalcid, *Brachymeria fonscolombei*, Dufour, were also obtained, this being the first record of the rearing of this parasite from blow-fly larvae removed from a wound. The Oestrid, *Cuterebra scudderi*, Tns., was obtained from the back of a third hare.

A Sheep Blow-fly Trap.—*J. Dept. Agric. Vict.*, xxxi, pt. 5, p. 213, 2 figs. Melbourne, May 1933.

A description is given of a simply constructed trap used with success in Australia against blow-flies infesting sheep. Half a petrol tin that has been divided longitudinally along opposite corners is baited with scraps of meat just covered with water containing arsenic at the rate of 1 lb. to 100 gals. water, and hung by a wire on the side of a tree. A 1½ lb. jam tin, containing a piece of liver or meat in fresh water and covered with tin gauze, is soldered to the end of the trap to provide an odour attractive to the flies.

McIndoo (N. E.). **Olfactory Responses of Blow-flies, with and without Antennae, in a Wooden Olfactometer.**—*J. Agric. Res.*, xlvi, no. 7, pp. 607–625, 4 figs., 7 refs. Washington, D.C., 1st April 1933.

The olfactory responses of three species of blow-fly (*Calliphora erythrocephala*, Mg., *Lucilia sericata*, Mg., and *Phormia regina*, Mg.) to the odours from fermenting and putrefying substances were investigated in Maryland in 1930. Notes are given on the method successfully employed for rearing the flies, and the olfactometer used is fully described. It consists essentially of a wooden box with a wire screen top, and two special cups in the bottom connected by tubes with a set of bottles and an electric force pump, so arranged that pure moist air is diffused through one cup and moist air bearing the odour to be tested through the other. The flies respond readily to currents of humid air, so that the pure humid air acts as a control. All the experiments were carried out in diffused light in a dark room.

The average responses of both sexes of the same species were practically the same. Solutions of fermenting sugar were attractive up to the 18th day, but with the addition of baker's yeast only up to the 20th hour, being afterwards repellent in either case. Since alcohol (up to a 6 per cent. concentration) was attractive, whereas carbon dioxide and acetic acid were repellent, it is inferred that the responses were largely due to the formation of these substances in the process of fermentation [*cf. R.A.E.*, A, xix, 546]. Milk and three of its constituents, lactic acid, lactose and casein, were always attractive ; sour milk was more so than fresh, suggesting that lactic acid is the most attractive ingredient. Fermented casein and baker's yeast were among the best attractants, the best being putrid meat and eggs.

No significant difference was observed in the responses of any of the three species after the antennae, with the so-called olfactory hairs, had been removed, even when the stumps (as in one experiment with *C. erythrocephala*) were covered with glue.

Nieschulz (O.). **Ueber die Bestimmung der Vorzugtemperatur von Insekten (besonders von Fliegen und Mücken).** [Determination of the Preferred Temperature of Insects (especially Flies and Mosquitos).]—*Zool. Anz.*, ciii, no. 1–2, pp. 21–29, 4 figs., 2 refs. Leipzig, 1st June 1933.

An apparatus is described by means of which the temperature most attractive to flies and mosquitos may be ascertained. Experiments,

in each of which five insects were used, showed the preferred temperatures to average 29·4°C. [84·92°F.] for freshly captured females and 25·9°C. [78·62°F.] for males of *Stomoxys calcitrans*, L., and 8·9°C. [48·02°F.] for females of *Culex pipiens*, L., that had hibernated in a cellar.

TOTZE (R.). **Beiträge zur Sinnesphysiologie der Zecken.** [Contributions to the Physiology of the Senses of Ticks.]—*Z. vergl. Physiol.*, xix, no. 1, pp. 110–161, 38 figs., 16 refs. Berlin, 1933.

This detailed account of laboratory investigations is divided into three parts, of which the first (pp. 113–119) deals with the artificial feeding of *Ixodes ricinus*, L., the second (pp. 119–154) with the reactions of this tick and *Hyalomma marginatum brionicum*, Schulze & Schlottke, to various physiological stimuli, and the third (pp. 154–158) with investigations on the effect on *I. ricinus* of several stimuli acting simultaneously.

In the feeding experiments, the ticks were placed on a membrane stretched over the end of a glass tube containing defibrinated or citrated blood. At first the nymphs and adults could not be induced to feed, but after removal of the tips of the first pair of legs, in which the Haller (olfactory) organ is situated, they attached themselves to the membrane and readily fed not only on blood but also on solutions of various acids, ammonia, etc., and salt liquids. This shows that in feeding the ticks are guided by the sense of smell, which plays a very important part in the finding of the host. Engorgement was more rapid at higher temperatures. The larvae invariably refused to feed, and though nymphs and adults were not affected by removal of the tarsi of the two middle pairs of legs, they did not feed if one or both of the hind tarsi were cut off.

The conclusions drawn from the experiments described in the second and third parts of the paper include the following: The ticks are sensitive to mechanical stimuli and so can orientate themselves on the surface on which they occur. They are greatly attracted by warmth, the reaction of the larvae being less pronounced than that of the other stages. The preferred temperature depended on that at which the ticks were kept before the experiments. During the season of activity the larvae and nymphs preferred the temperature at which they were reared (between 10 and 18°C. [50–64·4°F.]), and the adults a temperature 4°C. [7·2°F.] higher. For hibernation all stages preferred a temperature about 2°C. [3·6°F.] below that used for rearing them. Nymphs and adults from which the hind pair of legs had been removed showed a comparatively low power of differentiating between temperatures, similar to that of the larvae. The olfactory sense of the ticks is very acute and was not affected by overwintering. The reaction to light was positive when the ticks were starved, and negative when they were engorged. Sensitiveness to light decreased with age and the development of pigment. The ticks were capable of detecting moisture at a distance, which together with the attraction exerted by warmth, is of great assistance in finding a host.

Subjection of the ticks to several stimuli simultaneously showed that the individual senses vary greatly in their acuteness; that of smell is much the strongest and is followed, in order of importance, by the capacity to appreciate temperature, light and humidity.

Wilson (F. H.). **A Louse feeding on the Blood of its Host.**—*Science*, lxxvii, no. 2003, p. 490. New York, 19th May 1933.

Individuals of *Eomenacanthus* (*Menopon*) *stramineus*, Nitzsch, observed on a fowl showed a pigmented substance in the crop, indicative of blood. That this was not obtained from clots from accidental injuries to the host was strongly suggested by finding one of the lice, showing blood in the alimentary tract, with mandibles deeply sunken in the quill of a young feather from which the dermal papilla, bearing blood vessels, had not yet withdrawn. When the louse was removed, blood flowed from the wound. The injury appeared as if two holes, one for each mandible, had been pierced in the quill and then the partition separating them cut out. The quill showed many scars of the same type, and the unfolding barbs showed still older scars, suggesting that this type of feeding was habitual.

Badger (L. F.). **Rocky Mountain Spotted Fever and Boutonneuse Fever. A Study of their immunological Relationship.**—*Publ. Hlth. Rep.*, xlviii, no. 19, pp. 507–511, 4 charts, 3 refs. Washington, D.C., 12th May 1933.

In tests with the virus of Marseilles fever (transported from France to the United States in 6 individuals of *Rhipicephalus sanguineus*, Latr.) and the eastern type of Rocky Mountain spotted fever in guineapigs, each virus conferred immunity against the other. These results differ from those of Brumpt [*R.A.E.*, B, xx, 243], who used the western type of Rocky Mountian spotted fever virus, but it should be noted that he considered the upper limit of normal temperature for the guineapig to be 38·5°C. [101·3°F.], whereas the author considers it to be 39·6°C. [103·28°F.]

Parker (R. R.) & Davis (G. E.). **Protective value of Convalescent Sera of São Paulo Exanthematic Typhus against Virus of Rocky Mountain Spotted Fever.**—*Publ. Hlth. Rep.*, xlviii, no. 19, pp. 501–507, 2 charts, 3 refs. Washington, D.C., 12th May 1933.

The sera of laboratory animals recovering or recovered from the disease known as exanthematic typhus of São Paulo conferred a degree of protection against the virus of Rocky Mountain spotted fever sufficient to indicate a close relationship between them. In view of the suggestion that *Amblyomma cayennense*, F., is a vector of São Paulo typhus [*R.A.E.*, B, xxi, 67, 68], the authors point out that in the course of their studies on various ticks as possible vectors of Rocky Mountain spotted fever, they have shown that larvae of *A. cayennense*, fed on infected guineapigs, are able to transmit the infection in the subsequent nymphal and adult stages.

Dyer (R. E.). **Relationship between Rocky Mountain Spotted Fever and "Exanthematic Typhus of São Paulo".**—*Publ. Hlth. Rep.*, xlviii, no. 20, pp. 521–522. Washington, D.C., 19th May 1933.

Of 12 individuals of *Amblyomma cayennense*, F., fed on guineapigs infected with the disease called exanthematic typhus that occurs in the environs of São Paulo [*R.A.E.*, B, xxi, 67], 5 survived transit to the United States and infected guineapigs both by biting and when injected. Laboratory animals that had recovered from attacks of

European typhus were not immune from the São Paulo virus, whereas those that had suffered from Rocky Mountain spotted fever were. Moreover, an animal that had recovered from the São Paulo disease was immune from Rocky Mountain spotted fever. Descriptions of the epidemiology of the former and of its clinical symptoms in man and laboratory animals by South American authors together with the present author's observations indicate that it is identical with Rocky Mountain spotted fever.

HARVEY (D.). **Typhus and Typhus-like Diseases.**—*Trop. Dis. Bull.*, xxx, no. 6, pp. 343–349, 406, 24 refs. London, 1933.

Present knowledge on epidemic and endemic typhus and related diseases, such as tropical typhus, tsutsugamushi disease (Japanese river fever), Marseilles fever, Rocky Mountain spotted fever, etc., is briefly reviewed, their similarities being discussed and their differences shown in a table.

BLANC (G.), NOURY (M.) & FISCHER (M.). **Sensibilité de l'écureuil de Gétulie** (*Atlantoxerus getulus*) **au virus de la fièvre boutonneuse.**—*C. R. Soc. Biol.*, cxiii, no. 20, pp. 357–358. Paris, 1933.

In view of the positive results [*R.A.E.*, B, xix, 224] obtained with the Macedonian ground squirrel [*Citellus citellus*], experiments were made to test the susceptibility to Marseilles fever of another rodent *Atlantoxerus getulus*, which occurs in Morocco. The infection was successfully imparted by inoculation of blood from a human patient or of crushed females of *Rhipicephalus sanguineus*, Latr., from Marseilles, and was demonstrated by subinoculation into guineapigs.

TOUMANOFF (C.). **Sur le peuplement anophélien du bassin du Fleuve-Rouge au Tonkin.**—*Bull. Soc. Path. exot.*, xxvi, no. 5, pp. 741–747, 7 refs. Paris, 1933.

For studying the distribution of Anophelines in the basin of the Red River, Tonkin, the author divides it into four regions, the delta, the zone intermediate between this and the lower mountain region, the middle zone, and the zone of valleys in the high region ; the fauna of the high region itself has already been dealt with [*R.A.E.*, B, xx, 133, 214]. In the course of two years' observations 13,992 adult mosquitos and 26,868 larvae were examined. The composition of the fauna is related to the physiography of the localities. *Anopheles hyrcanus* var. *sinensis*, Wied., was the most prevalent species in the larval stage (10,346) but was not so abundant as *A. vagus*, Dön., in the adult stage (2,434 as compared with 6,524). Although it is widely distributed, it is most numerous in the delta and the intermediate zone. *A. barbirostris*, Wulp, of which 2,658 larvae and 50 adults were taken, was rare in the delta but almost evenly distributed in the other three regions. No adults of *A. aitkeni*, James, were captured ; larvae were practically confined to the middle and high valley zones, particularly the latter, although they were found once in the delta. *A. jeyporiensis*, James, was not recorded from the delta and was relatively rare in the other three zones. *A. minimus*, Theo., of which 2,202 larvae and 2,088 adults were taken, was rare in the delta but gradually increased in numbers in the intermediate and middle zones until, in the high valley region, it was one of the most numerous species. *A. aconitus*, Dön., showed

no marked preference for a particular site and was fairly prevalent even in the delta. *A. annularis*, Wulp (*fuliginosus*, Giles) (869 larvae and 528 adults) and *A. philippinensis*, Ludl. (374 and 1,079), were found in all four zones ; *A. maculatus*, Theo. (1,142 and 76) and *A. maculipalpis*, Giles (303 and 64) were absent from the delta but became more numerous as the altitude increased, *A. maculatus* being particularly abundant in the high valley region. Only 40 larvae and 3 adults of *A. karwari*, James, were captured. *A. tessellatus*, Theo., and *A. kochi*, Dön., are rare in Tonkin, but whereas the former was ubiquitous, the latter was most numerous in the middle and high valley zones.

The high proportion of malaria vectors [*cf.* xxi, 31], particularly *A. minimus*, in the middle and high zones appears to be significant, as these regions are also the most malarious.

van Hell (J. C.). **De malaria te Weltevreden, Batavia en Tandjong Priok in het jaar 1931.** [Malaria at Weltevreden, Batavia and Tandjong Priok in 1931.]—*Meded. Dienst. Volksgezondh. Ned.-Ind.*, xxii, no. 1, pp. 1–13, 1 plan. Batavia, 1933.

The chief vector of malaria in and near Batavia is *Anopheles sundaicus* Rdnw. (*ludlowi*, auct.), which breeds mainly in brackish fish-ponds covered with algae. Its control by almost emptying the ponds regularly so as to destroy the algae [*R.A.E.*, B, xix, 170] has resulted in a notable decrease in the incidence of the disease.

Walch (E. W.). **Over de gezondmaking van Banjoewangi.** [On Malaria Control at Banjoewangi.]—*Meded. Dienst. Volksgezondh. Ned.-Ind.*, xxii, no. 1, pp. 16–19. Batavia, 1933. (With a Summary in English.)

With reference to the control of malaria at Banjoewangi by admitting sea water into the fish-ponds where *Anopheles sundaicus* Rdnw. (*ludlowi*, auct.) was breeding [*R.A.E.*, B, xx, 218], it is pointed out that this method is not of general application as it involves the destruction of the fish.

Rodenwaldt (E.). *Microfilaria malayi* **im Delta des Serajoe. I.** [*M. malayi* in the Delta of the Serajoe River. I.]—*Meded. Volksgezondh. Ned.-Ind.*, xxii, no. 1, pp. 44–54, 1 map, 10 refs. **Zur Morphologie von** *Microfilaria malayi.—T.c.*, pp. 54–60, 2 figs., 7 refs. Batavia, 1933.

In the first paper an account is given of the geographical and other conditions in the delta of the Serajoe river, Java, where both a centre of elephantiasis of the legs and a high percentage of infections with *Filaria* (*Microfilaria*) *malayi* occur in villages. It was found, however, that the percentage of filaria infections was considerably lower among elephantiasis cases than among the general population. Microfilariae were found much more frequently in blood smears taken at night than in those taken by day. As a preliminary result of an investigation on mosquitos, the development of larvae of *F. malayi* up to complete maturity was observed in *Mansonia* (*Taeniorhynchus*) *annulifera*, Theo., *M.* (*T.*) *uniformis*, Theo., *M.* (*T.*) *indiana*, Edw., and *Anopheles hyrcanus* var. *sinensis*, Wied. All these mosquitos showed a high

percentage of infection, but *M. annulifera* was the most abundant species. The mosquitos were taken in larger numbers near swamps in which *Pistia stratiotes* and other floating water-plants occurred, and it was in neighbouring villages that cases of elephantiasis and carriers of *F. malayi* were most common.

HODGKIN (E. P.). *Anopheles hyrcanus* **Pallas as a Malaria Carrier in Malaya.**

HODGKIN (E. P.) & RAJAMONEY (P. D.). **A descriptive and biological Note on the Malayan Varieties of** *Anopheles hyrcanus* **Pallas.**—*Bull. Inst. Med. Res. F.M.S.*, no. 1 of 1932, 18 pp., 2 pls., 1 fldg. map., 31 refs. Kuala Lumpur, 1933.

In the first paper (pp. 1–6) a detailed account is given of the discovery that *Anopheles hyrcanus* var. *sinensis*, Wied., and var. *nigerrimus*, Giles, were transmitting malaria in an area of Kuala Lumpur in 1931 [*R.A.E.*, B, xx, 276]. In the second, the status and distribution of the varieties of *A. hyrcanus*, Pall., are discussed from the literature, with particular reference to var. *sinensis* and var. *nigerrimus*, the only ones recognised in Malaya. The adult and larva of each variety are described. The former includes all forms with narrow hind tarsal bands and the latter all those with broad bands and dark pigmentation. A difference in pigmentation of the larva is noted, but it is pointed out that in neither larva nor adult is there an absolute distinction between the two varieties.

PAPERS NOTICED BY TITLE ONLY.

MATHESON (R.). **A new Species of Mosquito** [*Aëdes klotsi*] **from Colorado (Diptera, Culicidae).**—*Proc. Ent. Soc. Wash.*, xxxv, no. 5, pp. 69–71, 1 fig. Washington, D.C., May 1933.

STONE (A.). **Two new Species of** *Tabanus* [*T. oklahomensis* and *T. bishoppi*] **from North America** [U.S.A.] **(Diptera).**—*Proc. Ent. Soc. Wash.*, xxxv, no. 5, pp. 75–77. Washington, D.C., May 1933.

JORDAN (K.). **Four new Fleas collected by Professor F. Spillmann in Ecuador.**—*Novit. zool.*, xxxviii, no. 2, pp. 343–348, 6 figs. **Two new Species of** *Ctenophthalmus* **from Tropical Africa (Siphonaptera).**—*T.c.*, pp. 349–351, 4 figs. **Fleas collected by Dr. Max Bartels in Java.**—*T.c.*, pp. 352–357, 7 figs. **Two new South American Bird-fleas.**—*T.c.*, pp. 358–361, 3 figs. Tring, 15th June 1933.

PETERS (H. S.). **External Parasites collected from Banded Birds** [54 species of parasites from 75 species of birds from the United States].—*Bird-banding*, iv, pp. 68–75, 1 ref. Boston, Mass., April 1933.

HECHT (O.). **Hautreaktionen auf die Stiche blutsaugender Insekten und Milben als allergische Erscheinungen.** [The Reactions of the Skin to the Bites of bloodsucking Insects and Mites as allergic Phenomena.]—*Zbl. Haut-u. GeschlKrankh.*, xliv, no. 5–6, pp. 241–255, many refs. Berlin, 1933.

ISAAC (P. V.). **Notes on *Paederus fuscipes* Curt., a Beetle which causes vesicular Dermatitis in Man.**—*Agric. & Live-stk. India.*, iii, pt. 1, pp. 33–36, 1 pl., 4 refs. Calcutta, January 1933. [Recd. June 1933.]

A brief description is given of the adult of the Staphylinid, *Paederus fuscipes*, Curt., which causes "spider-lick" [*R.A.E.*, B, xii, 154], a vesicular dermatitis of frequent occurrence in Bihar, Bengal, Assam and Ceylon in the hot dry season and believed to be due to entry into the human skin of some liquid from the body of the insect [*cf.* xv, 44 ; xviii, 16]. In Bihar the beetles were found living in colonies on damp soil near the banks of water-courses, where they hide during the day among low bushy vegetation, especially *Polygonum glabrum*. Many were destroyed by dusting with calcium cyanide and by the use of light traps.

IYENGAR (M. O. T.). **Filariasis in Trivandrum.**—*Ind. J. Med Res.*, xx, no. 4, pp. 921–938, 4 charts, 4 maps. Calcutta, April 1933.

In the course of a filariasis survey of Trivandrum, Travancore State, about 5,600 mosquitos were dissected. The only species found infected with *Filaria* (*Wuchereria*) *bancrofti* were *Culex fatigans*, Wied. (1,128 out of 5,477 individuals) and *Mansonia annulifera*, Theo. (1 out of 20). Both mature and immature larvae were seen in *C. fatigans*, whereas in *M. annulifera* the larvae were in a very early stage of development. In view of its prevalence and high rate of natural infection, *C. fatigans* appears to be the most important, if not the only, vector of filariasis, and this is supported by the observation that it bred most extensively, and was most numerous in houses, in areas where the microfilaria rates were high. Moreover, the natural infection rate in this mosquito in different sections of the town showed a close relation to the degree of infection among the population.

IYER (P. V. Seetharama). **A Rat-flea Survey of the Mysore State.**—*Ind. J. Med. Res.*, xx, no. 4, pp. 975–994, 1 map, 3 refs. Calcutta, April 1933.

With a view to making the rat-flea survey of southern India [*cf.* *R.A.E.*, B, xx, 27] more complete, it was extended to Mysore State, where plague is practically endemic. Six towns were surveyed during March and April 1932, particular attention being paid to differences in species of fleas in typically different towns and in typically different areas within them. Plague has been prevalent in epidemic form in all the selected localities at some time since 1898, when it was introduced from the Bombay Presidency, and only one had no mortality from the disease between 1922 and 1931. Brief notes are given on the climate and trade conditions of each town. The rodents trapped comprised 656 *Mus* (*Rattus*) *rattus*, 5 bandicoots and 11 mice. The density of the rats varied considerably in the different localities ; they were usually more numerous in bazaars than in residential areas. The 4,577 fleas taken on the rats included *Xenopsylla cheopis*, Roths., *X. astia*, Roths., and *X. brasiliensis*, Baker, the last-named representing 51 per cent. of the total number of fleas taken in the State. The proportions of the three species varied considerably from place to place, and the general flea index ranged from 4·35 to 13·35. The bandicoots harboured more fleas than the rats, the average number being nearly 53 per animal, of

which 88 per cent. were *X. astia,* 9 per cent. *X. cheopis* and only 3 per cent. *X. brasiliensis.*

A comparison of the places surveyed showed relatively high flea indices for *X. astia* and *X. cheopis* in the locality where plague is comparatively absent and *X. brasiliensis* does not occur. The indices for the first two species varied little from place to place, whereas that for *X. brasiliensis* was very variable, which may indicate that there is some special factor or factor affecting this species alone The relatively high incidence of plague in one town may be connected with its being a cotton centre and thus exposed to the importation of infected adult fleas. There is practically no cotton or grain trade in the two towns where the plague incidence is lowest. From the low *astia* index in the 4 towns that have suffered most from plague and the high percentage of rats free from this species, it is concluded that it plays practically no part in transmission. The *cheopis* index was highest in the two towns with the lowest plague incidence, whereas the *brasiliensis* index was highest in the other four towns. These observations suggest that *X. brasiliensis* is associated with the transmission of plague in nature, though no definite conclusion can be drawn from the figures, as *X. cheopis* is also present. Figures for the general flea index show that fleas were much more abundant in warehouses than elsewhere, and that they were at least as abundant in ordinary houses and huts as in bazaar areas. The *astia* index was low but definitely higher in huts and houses than in bazaars, etc. The fact that it was most numerous on the periphery of towns and was also the commonest flea on field rats and bandicoots confirms the conclusion that it is probably indigenous. *X. brasiliensis* seems to be definitely associated with the grain trade, being abundant in grain warehouses and relatively scarce in cotton mills and cotton warehouses. This view is supported by the fact that it was the only species that was more numerous in bazaar areas than in residences.

KING (Harold Holmes) & IYER (P. V. Seetharama). **The Seasonal Prevalence of Rats and Rat-fleas in Parts of South India.**—*Ind. J. Med. Res.*, xx, no. 4, pp. 1067–1081, 1 chart, 6 refs. Calcutta, April 1933.

In the course of the rat-flea survey of the Madras Presidency [*R.A.E.*, B, xx, 27], it was found that places surveyed between September and January showed higher flea indices than those surveyed during the hot and dry months. In order to obtain more accurate data on this point, rat-flea surveys were carried out at Saidapet, Coimbatore and Bellary, localities representative of different types of climate, during the hot weather, during or at the end of the south-west monsoon, and, at Saidapet and Coimbatore, during the cold weather after the north-east monsoon. Each survey lasted about 10 days, the main bazaar and a residential area being selected for study. At Coimbatore and Bellary, both centres of the cotton trade, separate data were obtained for fleas in warehouses and cotton mills. No epizootics of plague occurred at any of the places under observation.

Xenopsylla astia, Roths., *X. cheopis*, Roths., and *X. brasiliensis*, Baker, were found at Coimbatore, the first two species at Bellary, and the first species alone at Saidapet. The most outstanding feature of the surveys was the markedly high rat-flea indices for the cold weather (December) in both areas of all three localities. In this month, the indices for cotton mills at Coimbatore reached 14·1 and for cotton

warehouses at Bellary 13·14, the highest recorded during the surveys. In these two localities in the middle of the hot season, there was a marked diminution in the prevalence of fleas, which reached their minimum numbers in April and May ; the reduction was much greater in residential areas, cotton mills and warehouses than in bazaars. It would appear that the rapid decline in the incidence of plague in man at the beginning of the hot weather must be related mainly to this reduction. Saidapet was surveyed in March, before the hot weather conditions were established, and the decrease in the numbers of *X. astia* was consequently not so marked ; moreover the hottest weather in this locality occurred during the August survey. Whereas at Coimbatore, after the onset of the south-west monsoon on the west coast, the weather becomes cooler and there is a decided tendency for the number of fleas per rat to increase, at Saidapet (close to Madras City) the hot weather persists for nearly 7 months from April and the flea index for August was lower than for March. The absence of species of *Xenopsylla* other than *X. astia* at Saidapet and the great preponderance of this species in other localities on the east coast may possibly be due to its ability to withstand long periods of hot weather.

A rise in temperature may affect the prevalence of fleas either by shortening their lives or by reducing their activity so that fewer are found on rats (an apparent not a real reduction). From the point of view of plague transmission it is the activity of the fleas that is of importance, and the great rise in the percentage of rats without fleas that occurred in the hot weather, particularly in the case of *X. cheopis*, is suggestive of the manner in which seasonal factors affect the arrest of transmission. The marked disparity between the indices of *X. cheopis* in the cool and hot months shows that this species is more susceptible to changes of temperature than *X. astia*, and also that a continued low temperature is more favourable to it. Whereas the indices of both these fleas begin to increase during July and August, that of *X. brasiliensis* shows a decline in July and only definitely increases with the onset of cold weather, thus suggesting that this species requires a still lower temperature than *X. cheopis* and probably explaining why in southern India its distribution is mainly confined to the Mysore plateau. A higher proportion of males in *X. cheopis* and *X. brasiliensis* and of females in *X. astia* was observed in all the localities surveyed. There was no marked association of sex prevalence with season.

MARTINI (E.). **The Hypopygia of certain Anophelines (Diptera: Culicidae).**—*Proc. Ent. Soc. Wash.*, xxxv, no. 5, pp. 61–67, 3 figs., 13 refs. Washington, D.C., May 1933.

The author discusses the characters of the male hypopygium in races of *Anopheles maculipennis*, Mg., from material collected during 1931 from various localities in Germany and Italy. His observations confirm the conclusions of de Buck, Schoute and Swellengrebel [*R.A.E.*, B, xviii, 228] and of La Face [xx, 119] that in the race *atroparvus* van Thiel—*labranchiae*, Falleroni, the most dorsal spine on the claspette is practically always acute and that in the race *messeae*, Falleroni, it is generally blunt or short-tipped. The author found that this spine in the typical *A. maculipennis* is in most cases blunt. The hypopygium of *A. maculipennis* in America as figured by Root [xi, 206] and Frost [xx, 220] is similar to that of *atroparvus*

—*labranchiae*. The author reiterates the statement made in a previous paper [xix, 24] that " the variability of the hypopygium of *A. maculipennis* is too great to allow a clear separation from the most closely related species."

BARBER (M. A.) & FORBRICH (L. R.). **Malaria in the Irrigated Regions of New Mexico.**—*Pub. Hlth. Rep.*, xlviii, no. 22, pp. 610–623, 1 map, 2 refs. Washington, D.C., 2nd June 1933.

Further surveys [*cf. R.A.E.*, B, xvii, 173] have shown that malaria is now present in at least three areas of New Mexico in the Rio Grande and San Juan valleys, in all of which *Anopheles maculipennis*, Mg., occurs. *A. punctipennis*, Say, a potential vector [*cf.* xvi, 237, etc.], is found only in the Pecos and Canadian River valleys, where *A. maculipennis* has not been observed. *A. pseudopunctipennis*, Theo., a known vector elsewhere [xx, 209, etc.], is more widely distributed, but of 263 females of this species collected in a malarious district none contained the parasite, whereas of 868 of *A. maculipennis* 1·4 per cent. were positive. Observations suggested that *A. pseudopunctipennis* seeks houses for shelter rather than for food and is sometimes actually deterred from entering inhabited houses, perhaps by smoke. *A. maculipennis* tended to breed in cool shaded water and *A. pseudopunctipennis* in water exposed to the sun, but larvae of both species often occurred together, except at the extremes of temperature. In the south of the State *A. maculipennis* was very numerous in seepage water overgrown with reeds, etc., where larvicidal fish did not occur, and there is some danger that the extension of irrigation may increase Anopheline breeding. There was no evidence that lucerne and sweet clover [*Melilotus*] checked the spread of malaria [*cf.* xx, 250, etc.], or that *Chara* reduced the breeding of Anophelines [*cf.* xix, 209], though all three are abundant in New Mexico. The distribution of *Gambusia* has given good results in some districts. Education in the use of screens, etc., offers the best prospect of control.

BACIGALUPO (J.). *Anisolabis annulipes* **(Lucas), nouvel hôte intermédiaire du** *Gongylonema neoplasticum* **(Fibiger-Ditlevsen).**—*C. R. Soc. Biol.*, cxiii, no. 21, pp. 474–475, 2 refs. Paris, 1933.

Anisolabis annulipes, Lucas, was found to be an intermediate host in Argentina of *Gongylonema neoplasticum*, which had been observed infesting 35 per cent. of the rats examined. Experimentally the earwigs were very readily infected with the Nematode, which they probably harbour more frequently than either of the other known insect hosts in Argentina, *Periplaneta americana*, L., and *Tenebrio molitor*, L.

MENZEL (R.). **Pyrethrum gegen Chloropiden.** [Pyrethrum against Chloropids.]—*Anz. Schädlingsk.*, ix, no. 6, p. 84. Berlin, June 1933.

GÖSSWALD (K.). **Erfolgreiche Bekämpfung von Chloropiden mit Pyrethrum.** [The successful Control of Chloropids with Pyrethrum.]—*Loc. cit.*

In the first of these notes pyrethrum extract [*cf. R.A.E.*, B, xviii, 241] is stated to have given good control of Chloropid flies in Switzerland. The second records a mass-infestation of a hospital at Munich

that was successfully controlled by means of a pyrethrum dust, Dusturan [A, xxi, 435], the flies falling on the floors in a layer 1 cm. deep. It is suggested that the preference of Chloropids for Virginia creeper [B, xxi, 122] could be utilised by attracting them to portable screens covered with creepers growing in pots and then applying the dust.

NASH (T. A. M.). **The Ecology of *Glossina morsitans*, Westw., and two possible Methods for its Destruction.**—*Bull. Ent. Res.*, xxiv, pts. 1–2, pp. 107–157, 163–195, 2 pls., 8 graphs, 41 refs. London, March & July 1933.

A detailed account is given of investigations on *Glossina morsitans*, Westw., carried out in the neighbourhood of Kikori, Tanganyika Territory, for 4½ consecutive years, much of the information confirming that given in a previous paper [*R.A.E.*, B, xviii, 240].

The following is largely taken from the author's general summary and conclusions : After giving meteorological data for the period and describing the fly rounds, in which the unit used was the number of flies per boy in 100 yards, the author discusses the fluctuations in fly population during the 4½ years and also the annual seasonal fluctuations. During the favourable years 1928 and 1929, the fly increased and attempted to colonise an area that could only temporarily support it ; its outward spread was checked by insuperable natural barriers. In April and May 1930, the fly population was almost exterminated by torrential rains, and it survived only in small numbers in its true habitats. Subsequently its numbers slowly and steadily increased, but at the end of the investigations they were still too depleted to allow of renewed expansion for some time. The author concludes that this depletion was more probably due to the destruction of the pupae, which were found incapable of withstanding immersion or burying in water-logged soil for more than 4 days, than to arrested reproduction due to low evaporation or to a fungus that was found to attack the adults. This suggests that riverine infestations by *G. palpalis*, R.-D., might be destroyed in suitable localities by damming the stream and flooding the banks for some distance on either side.

With regard to seasonal fluctuations, it was found that the numbers decrease regularly towards the end of the long dry season in September and October (reaching a minimum in November), increase in the middle of the rains (reaching a maximum in February during the short dry season), decrease again slightly during the heavy rains in March and April and then fluctuate according to the rainfall. After poor rains, a great increase takes place in May, reaching a maximum in June and, after a temporary decrease due to a cold spell about July, the numbers rise again before descending to the minimal point at the end of the dry season. After heavy rains and a very wet April, the numbers decrease in May, reaching a minimum in late May or June, but rise again as the country dries, reaching a relatively high figure in August before dropping again to the minimal point, the cold spell in such years being less severe and showing little effect. The seasonal fluctuations have been found to be related to evaporation rate [xix, 253], any departure from the optimum of 20–25 cc. a day being reflected in a decrease of the fly two to five weeks later.

The effect of season on breeding, on the duration of the pupal period, on female activity and on fly concentration, and the effect of seasonal

grass fires (as opposed to artificial controlled burnings) on density are also discussed. From a study of the seasonal, vegetational and game factors, it is concluded that climate is the most important factor influencing density and distribution, but that vegetation is of vital importance, as the fly's ability to withstand adverse climatic conditions depends on the presence of a favourable vegetation community. Thus the fly would probably be exterminated during a year of abnormally severe climatic conditions if this type of true habitat to which it normally retreats had previously been destroyed. Game does not appear to be of much importance in limiting the distribution of *G. morsitans* in Tanganyika, as there can be few parts where there is not sufficient game to satisfy its needs. Places where the fly breeds at all times of the year, where it concentrates after fires and where a sufficient amount of game is present, are likely to constitute true habitats. Some vegetation communities that are unsuitable as habitats are used as feeding grounds ; to these areas, females and young flies are driven by hunger when they have failed to find food in the true habitat, and whereas in the latter the apparent numbers of females are low, in the former they are relatively higher. It has been found that hungry flies tend to follow paths and congregate for a short time at their junction, and it is suggested that flies might be concentrated at traps by cutting artificial game paths to them. *G. morsitans* is usually inactive at night and only becomes active in the morning when the weather has reached a certain degree of warmth and atmospheric dryness.

Investigations into the parasites in the district showed that the Bombyliids, *Thyridanthrax abruptus*, Lw., *T. lineus*, Lw., and *T. argentifrons*, Aust., were the most important, constituting 6 per cent. of all emergences from puparia collected during the 4½ years, but as they could not be bred in the insectary, attempts to control the fly by the release of large numbers of parasites in breeding areas were carried out with *Syntomosphyrum glossinae*, Wtrst., which constituted only 0·2 per cent. of the emergences. A satisfactory technique evolved for breeding and liberating this parasite is described. It is feared that the experiment will fail owing to the inability of the parasite to attack puparia in sandy soils, but results suggest that such a method might be successful in districts where the fly breeds in humus.

Since experiments have shown that puparia cannot survive the heat of the sun, traps attractive to pregnant females have been devised ; these consist of felled tree trunks raised on small branches that act as rollers and enable the sheltered ground to be easily exposed to strong sunlight. These traps have not been given a large-scale field trial, but they are cheap and easy to construct, and females have been found to desert breeding sites under rocks in their favour. They concentrate the breeding of a given area to a few artificial sites and are at least useful in providing a constant supply of puparia for laboratory purposes. Attempts to devise traps imitating breeding sites under rocks were unsuccessful.

MELLANBY (K.). **The Influence of Temperature and Humidity on the Pupation of** *Xenopsylla cheopis*.—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 197–202, 2 figs., 5 refs. London, July 1933.

In previous experiments on the effect of humidity and temperature on *Xenopsylla cheopis*, Roths. [*R.A.E.*, B, xx, 162], it was found that

larvae were very easily killed on exposure to dry air (24 hours at 23°C. [73·4°F.] in perfectly dry air proving fatal) but that adults were much more resistant (surviving exposure for 24 hours at the same temperature and all humidities). In the present paper, an account is given of experiments to determine the effect of temperature and humidity on *X. cheopis* during the period when it is transforming from a non-resistant larva to a resistant adult. The results indicate that the pupa, like the adult, is resistant to dry air, whereas the prepupa, like the larva, is not, the cocoon being no protection. At a relative humidity of 90 per cent. and temperatures of 18, 22, 29 and 35°C. [64·4, 71·6, 83·2 and 95°F.] pupae were formed much more rapidly at the higher than at the lower temperatures, more than 75 per cent. pupating in 4 days at 35°C. and in 8 days at 18°C. When larvae were kept at 14°C. [57·2°F.], no pupae were formed, but adults were obtained when larvae were kept for a week at 14°C. and subsequently exposed to a temperature of 16°C. [60·8°F.] ; thus the developmental zero appears to be about 15°C. [59°F.] Between 18 and 29°C., pupation took place successfully at 60 per cent. relative humidity, but a humidity of 40 per cent. was unfavourable. The rate of loss of water from the larva appears to be proportional to the saturation deficiency of the air, at least at 18, 22 and 29°C., when the time that elapses between spinning the cocoon and the formation of the pupa is taken into account.

HAMLYN-HARRIS (R.). **Some Ecological Factors involved in the Dispersal of Mosquitos in Queensland.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 229–232, 1 pl., 2 refs. London, July 1933.

The author describes the breeding-places of *Aëdes vigilax*, Skuse, the most troublesome mosquito pest of the coastal areas of Queensland, and of *A.* (*Mucidus*) *alternans*, Westw., which is generally associated with it, and discusses at some length the conditions under which these mosquitos are distributed over wide areas at great distances from their natural breeding-places.

LLOYD (Ll.), LESTER (H. M. O.), TAYLOR (A. W.) & THORNEWILL (A. S.). **Experiments in the Control of Tsetse Fly. Part II.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 233–251, 2 fldg. maps, 2 figs., 5 refs. London, July 1933.

An account is given of further tsetse investigation work in Northern Nigeria from the beginning of June 1926 to the end of October 1929 [*cf. R.A.E.*, B, xv, 165].

The following is largely taken from the authors' summary. The main object of the work was to destroy the primary and secondary foci of *Glossina* by clearing all fringing forest without touching the general woodland. Methods of clearing and of dealing with re-growth are described in detail. Records show that although re-growth is very rapid during the first year, it subsequently slows down to such an extent that it may not be economical to re-slash more often than every third year. The effect of clearing was estimated by collecting flies week by week from certain fixed foci and examining them, as described in the previous report [*loc. cit.*]. In the case of *G. morsitans*, Westw., clearing of the fringing forest up to 800 yards from the collecting centre had no apparent effect on the wet season extension of the fly, but when the distance to the nearest uncleared primary focus was extended to 4 miles, the numbers caught were reduced to a sixth of the figure

obtained before clearing was begun. In the case of *G. tachinoides*, Westw., however, there was a marked reduction of density when the clearing extended for 300 yds. from the collecting centre, and when it extended for more than 800 yds., there was practically no migration from uncleared areas. When the savannah behind the fringing forest was also cleared, the reduction in the numbers of *G. morsitans* was more marked. Observations on the fenced area confirmed previous conclusions, except that the adverse effect of game exclusion on *G. tachinoides* appears previously to have been overestimated. In most respects the incidence of this species remained normal until the focus was cleared, whereas in the case of *G. morsitans* the flies caught had migrated from neighbouring foci.

The Matyoro experimental area consists of a chain of swamps and lakes, which constitute the only permanent surface water for many miles, the surrounding country being dry and sandy and covered with a thin deciduous forest. *G. morsitans, G. tachinoides* and *G. palpalis*, R.-D., were prevalent, and the area was completely uninhabited. Clearing was begun in the dry season of 1926–27, and during this and the following two seasons 6½ miles of the valley were cleared including the fringing forest and the adjacent heavy woodland savannah. In January 1929, *G. morsitans* and *G. palpalis* were not found, and *G. tachinoides* was scarce. In July 1929, groups of settlers were farming in the clearing, and only a few tsetse were found except at the edges of the clearings. Localised protective clearings have been made in various parts of the country, varying in size from small block clearings to others of considerable extent ; their cost has been reduced and their efficiency increased by the application of methods learnt in the experimental areas. Further experiments in deferred grass burning were carried out, and these afford additional evidence that late burning results in a considerable mortality of adults and pupae. The reduction is, however, obscured in a short time by invasion from outside areas, and it is concluded that the net results do not justify the expense and trouble involved.

LEVER (R. J. A. W.). **Status of Economic Entomology in the British Solomon Islands.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 253–256, 10 refs. London, July 1933.

Though malaria is fairly common in the British Solomon Islands, the percentage of infected mosquitos on most estates is relatively low. The early stages of *Anopheles punctulatus*, Dön., the only vector, are generally found in temporary accumulations of water, such as collect in hoof-marks and cart ruts. Filariasis is not prevalent except in the Santa Cruz Islands, where it is probably spread by *Aëdes scutellaris*, Wlk. (*variegatus*, Dol.). In the outlying Sikiana group this mosquito is represented by *A. scutellaris* var. *tongae*, Edw. [*R.A.E.*, B, xiv, 217]. House-flies (*Musca vicina*, Macq.) are now very common, especially on plantations where both horses and cattle are usually kept, although about 20 years ago they were apparently unknown.

GIBBINS (E. G.). **Eggs of some Ethiopian *Anopheles* Mosquitos.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 257–262, 10 figs., 2 refs. London, July 1933.

The eggs of the following species of *Anopheles* from Uganda are described and illustrated : *A. coustani* (*mauritianus*) var. *ziemanni*,

Grünb., *A. implexus*, Theo., *A. pharoensis*, Theo., *A. theileri* var. *hancocki*, Edw., *A. christyi*, Newst. & Cart., *A. gambiae*, Giles, *A. demeilloni*, Evans (*transvaalensis*, auct. nec Cart.), *A. funestus*, Giles, *A. marshalli*, Theo., and *A. moucheti*, Evans. No local variations were observed in eggs of *A. gambiae* and *A. funestus* from four different localities. Individual variation among the eggs of a single adult was found to be constant in the case of *A. marshalli*, the three forms figured being represented in each of the three batches examined.

LEWIS (E. A.). **Observations on some Diptera and Myiasis in Kenya Colony.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 263–269, 13 refs. London, July 1933.

An annotated list is given of the Calliphorids, Muscids and Oestrids that have been recorded as associated with myiasis of man and animals in Kenya Colony.

POTTS (W. H.). **Observations on** *Glossina morsitans*, **Westw., in East Africa.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 293–300, 6 refs. London, July 1933.

This is a preliminary account of investigations undertaken in Tanganyika to determine the effect of temperature on the pupal stage of *Glossina morsitans*, Westw., using puparia deposited in the laboratory or collected from natural breeding sites. The technique adopted in breeding the puparia is described. There were indications that the blood of cattle was more suitable for feeding purposes than that of goats. Clipping the wings of the flies to reduce the risk of escape did not affect female mortality or production of larvae. A sex ratio of 5 females to 3 males appeared to give the best results. Neither the shading of receptacles, nor their nature (whether beakers or lamp chimneys) affected significantly the mortality of the females or the production of larvae. The number produced by one female in May was almost double that produced in any subsequent month, and this fact, together with field observations made in 1929–30 that the greatest proportion of pregnant females was caught in April, suggests that there may be an increase in breeding activity at this time of the year. Larviposition usually occurred during the late afternoon or at night, and of the 515 normal-sized larvae deposited only 7·7 per cent. failed to pupate. The puparia were slightly smaller and lighter than those obtained from natural breeding sites. A total of 86·8 per cent. of the pupae produced adults, the numbers of the sexes being equal. The pupal period averaged 45·9 days, 47·2 for males and 43 for females. It varied with the mean noon temperature at different seasons from 30·9 days at 77·3°F. to 48·5 at 70°F. At 86°F., it was reduced experimentally to 23·1 days, but the mortality was nearly doubled (26·3 per cent.) ; at 95°F., all pupae were found to be dead after 13 days. Examination of series of puparia from natural breeding-places showed that more than half may be dead at the moment of collection but that transference to laboratory conditions does not interfere appreciably with emergence. In a series of 2,185 puparia, less than 0·2 per cent. were parasitised by *Syntomosphyrum glossinae*, Wtrst., but proportions, varying in different series from 2·2 to 9·9 per cent., were parasitised by the Bombyliids, *Thyridanthrax abruptus*, Lw., which was the commonest, *T. lineus*, Lw., and *T. argentifrons*, Aust.

In tests to discover a method for determining the viability of puparia collected from natural breeding-places without breaking them open, it was found that on immersion in methylated spirit the puparia that sink may be considered to be alive, and on the subsequent immersion in petrol of those that floated in spirit, those that sink may be taken as parasitised and those that float as dead.

Tentative conclusions drawn from a number of experiments on the effect of heat on puparia are summarised as follows: The degree of temperature lethal to puparia was found to depend on duration of exposure. Thus, whereas they survived exposure to 55–57°C. [131–134·6°F.] for 2 minutes, 45–50°C. [113–122°F] was lethal when the exposure lasted for half an hour; even 40°C. [104°F.] was lethal when continued for 4 hours or more, and they failed to survive 13 days at 35°C. [95°F.]. Exposure to 0°C. [32°F.] for as long as 24 hours may increase the mortality, but for 1–1½ hours it did not. Adults recovered from similar exposures of 3 and 12 hours duration, although their ability to digest blood may have been impaired. Burying puparia in sand saturated with water, or covering them entirely with shellac gave 100 per cent. mortality, but neither the occlusion with shellac of the so-called respiratory lobes alone, nor the application of a patch of shellac to the anterior end proved fatal. Immersion in water was not harmful, but may have delayed emergence. Adult flies survived short exposures to 40°C., even when repeated a number of times, but were not able to withstand continuous exposures to this temperature for an hour.

CHORLEY (C. W.). **Traps for Tsetse-flies of the "Crinoline" and "Ventilator" Forms. With a Prefatory Note by C. F. M. Swynnerton.**—*Bull. Ent. Res.*, xxiv, pt. 2, pp. 315–318, 1 pl., 8 refs. London, July 1933.

Brief descriptions are given of three types of traps and their variations, which are modifications for use against *Glossina palpalis*, R.-D., of traps employed in other countries for catching mosquitos, blowflies, etc. They all consist essentially of a catching-cage with a non-return entrance from which depends a rectangular or circular "cylinder," 18 inches to 3 ft. in length, constructed of wood or tin or of material kept open by hoops. Both the "crinoline" type (in which a rectangular or cylindrical skirt of material depends from the catching cage) and the modifications of the Wahl and du Plessis trap [*cf. R.A.E.*, B, xii, 19] are suspended by a swivel or bicycle hub and rotated by the action of the wind on four cups (made from diagonally bi-sected petrol tins) depending from two horizontal rods in the form of a cross attached to the trap. Both these traps may also be striped to give the impression of progressive movement. Means by which the garbage-tin trap [*cf.* iv, 181] might be adapted to tsetse are also suggested. With the successful conclusion of the present promising experiments with scents attractive to flies, it is probable that all the traps described will be used with scent as an attractant. The fat of cormorants and crocodiles has been found distinctly attractive, as well as extracts from animal glands [*cf.* xxi, 114].

MACLEOD (J.). **Control of the Sheep Tick on Hill Pastures. A Review of the Possibilities, with some experimental Data.**—*Trans. Highl. Agric. Soc. Scot.*, 1933, reprint 15 pp. Edinburgh, 1933.

The various methods of control hitherto employed against *Ixodes ricinus*, L., a common pest of sheep in the Scottish hill districts, are

discussed, and a brief life-history of this tick is given [*R.A.E.*, B, xx, 274; xxi, 74]. No single method is completely adequate to ensure eradication. The starvation method, which involves removing all stock from the pastures from March to November for at least two successive years, is not completely effective, because a number of engorged ticks are dropped on the pastures by birds or small wild mammals. Even a combination of starvation and burning of the pastures did not prove effective in killing all the ticks, as engorged ticks secrete themselves in the crevices of the soil and escape the fire. If serial dipping alone were used, it could be confined to the tick seasons of spring and autumn, but as occasional ticks appear on the sheep at other times of the year, and as ewes with lamb could not be dipped in spring, such dippings would have to be continued over a great number of years.

The combination of the serial dipping (a series of dippings at intervals of not less than 3 days) and starvation methods removes certain disadvantages incidental to the use of either method alone and appears to be the most practical means offering a fair chance of success. Alternate removal of stock and intensive grazing ensures that when the sheep are put on the ground they pick up the maximum number of starved ticks, whereas the part of the farm in which the ticks are being starved is not entirely lost for grazing, such land being intensively grazed in spring and autumn. Intensive stocking reduces the natural cover for the remaining ticks, rendering them more liable to death from climatic causes. In applying the combined method, natural boundaries and general economic considerations would decide whether half, one-third or a fourth of the farm is to be freed from ticks at a time. The area is fenced off and the sheep removed from it. Newly-dipped sheep are placed in this area in April or early May and dipped periodically while there. The duration of their stay will be determined by the intensity of stocking, condition of the ground, and effect of successive dippings on the sheep. In September the ground is again heavily stocked for a short period and serial dippings carried out. Towards the end of November the area can be thrown open to the stock for the winter months when the ticks are inactive. The stock is removed in March, and in May serial dippings are again carried out. Two years of this treatment should materially affect the tick population of the area, and the next section may be dealt with the following year. As an extra measure sheep not undergoing serial dippings in the autumn might be dipped whenever possible.

NIESCHULZ (O.). **Some Remarks about the Rôle of true Blood-sucking *Musca* Species as Transmitters of Diseases.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 2, pp. 213–214, 7 refs. Liverpool, 7th July 1933.

The author reviews the work done on the transmission of surra, anthrax and haemorrhagic septicaemia of buffaloes by *Philaematomyia* (*Musca*) *crassirostris*, Stein.

DUKE (H. L.). **A Study of the Behaviour of *T. rhodesiense* recently isolated from Man, in Antelope and other African Game Animals. Part I.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 2, pp. 215–236, 6 refs. Liverpool, 7th July 1933.

A detailed account is given of experiments to determine the behaviour of *Trypanosoma rhodesiense* in game animals, the ultimate

object of the investigations being to discover whether, after a year or two in antelopes, this trypanosome retains its power to infect man. The three strains of *T. rhodesiense* used were obtained from Tinde Laboratory, Tanganyika Territory, and had recently been isolated from natives by inoculation of their blood into white rats. Infection was transmitted by the bite of cyclically-infected laboratory-bred flies (*Glossina palpalis*, R.-D., or *G. morsitans*, Westw.) to a reedbuck, 3 bushbuck, an oribi, a ntalaganya (*Cephalopus caeruleus melanorrheus*), 4 wild pigs and a serval cat. The reedbuck, bushbuck and oribi showed no noteworthy symptoms ascribable to trypanosome infection, but the ntalaganya died of uncomplicated trypanosomiasis in 110 days. The wild pig, although susceptible to infection, appeared to be a very unsuitable host for the trypanosome. Clean, laboratory-bred flies were infected from the reedbuck, the bushbuck and the ntalaganya, 107, 108 and 87 days respectively after the original infection of the animal. It was difficult to infect clean individuals of *G. palpalis* from an infected pig, although the reverse was the case with the blood of the serval cat.

YORKE (W.), MURGATROYD (F.) & HAWKING (F.). **The Relation of Polymorphic Trypanosomes, developing in the Gut of *Glossina*, to the Peritrophic Membrane.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 2, pp. 347–354, 2 pls., 6 refs. Liverpool, 7th July 1933.

The following is largely taken from the authors' summary : During the course of experiments on the transmission of a tryparsamide-resistant strain of *Trypanosoma brucei* through *Glossina morsitans*, Westw., and *G. palpalis*, R.-D. [*cf. R.A.E.*, B, xxi, 135], observations were made regarding the position of the developing trypanosomes in relation to the peritrophic membrane of the mid-gut and proventriculus. After the first few days of the infection, trypanosomes were found to be limited to the space outside the peritrophic membrane, between the membrane and the gut wall. As the infection develops, the trypanosomes gradually extend forwards along this extraperitrophic space as far as the proventriculus, where they pass through the fluid secretion of the annular pad (from which the membrane is formed) and so reach the lumen of the proventriculus and oesophagus. Drawings of sections are given demonstrating this development of the infection. These observations confirm those previously published by Taylor in a paper already noticed [xx, 275].

EVANS (A. M.). *Anopheles demeilloni* **sp. n., a new Name for** *Anopheles transvaalensis* **of Authors.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 2, pp. 265–269, 1 fig., 4 refs.

EVANS (A. M.) & DE MEILLON (B.). **Notes on** *Anopheles demeilloni* (*transvaalensis*) **and** *Anopheles garnhami* **in South Africa, with Descriptions of New Varieties of these Species.**—*T.c.*, pp. 271–282, 9 figs., 8 refs. Liverpool, 7th July 1933.

In view of the fact that *Anopheles transvaalensis*, Carter, has been found to be identical with *A. marshalli*, Theo., the species usually identified as *A. transvaalensis* is redescribed under the name *A. demeilloni*. As the larva of *A. marshalli* var. *keniensis*, Evans [*R.A.E.*, B, xix, 153] has recently been shown by Symes [xx, 208] to be related

more closely to *A. demeilloni* (*A. transvaalensis*, auct.) than to *A. marshalli*, it is here raised to specific rank.

The characters distinguishing the adults, larvae and pupae of *A demeilloni*, *A. demeilloni* var. *carteri*, n., *A. garnhami*, Edw. [xix, 12] and *A. garnhami* var. *walshi*, n., are given ; until recently, these forms have all been included under *A. transvaalensis*, auct., in South Africa.

Duke (H. L.). **Relative Susceptibility of the Sexes of *Glossina* to Infection with Trypanosomes.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 2, pp. 355–356. Liverpool, 7th July 1933.

In a previous paper it was suggested that there existed no significant difference between the sexes of *Glossina palpalis*, R.-D., in their susceptibility to infection with *Trypanosoma gambiense* or *T. rhodesiense* [*R.A.E.*, B, xviii, 175], but after examining the data there presented, J. S. McDonald considers that this conclusion is not justified by the evidence and shows mathematically that, at least under laboratory conditions, the female of *G. palpalis* is more susceptible than the male. Regarding this conclusion, the author points out that female flies as a rule feed somewhat more readily than the males and that they tend to survive better in captivity.

The Identity of *Culex aegypti* L.—*Ann. Trop. Med. Parasit.*, xxvii, no. 1, pp. 182–184 ; no. 2, pp. 357–360. Liverpool, 10th April & 7th July 1933.

In the first paper Prof. W. S. Patton expresses the view that Dr. F. W. Edwards' adoption of the name *Aëdes aegypti*, L., for the yellow fever mosquito is unjustified and considers that *A.* (*Stegomyia*) *fasciata*, F., should be retained for it ; in the second, Edwards replies to this criticism, a final note by Patton being appended.

Grantham-Hill (C.). **Preliminary Note on the Treatment of infected Wounds with the Larva of *Wohlfahrtia nuba*.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxvii, no. 1, pp. 93–98, 1 pl., 16 refs. London, June 1933.

The natural occurrence in the Sudan of cases in which dirty superficial wounds are infested with maggots with little if any harmful consequences, together with Baer's report on the treatment of chronic osteomyelitis with blow-fly larvae [*R.A.E.*, B, xx, 125 ; *cf.* xxi, 174, etc.], led the author to investigate the effect of infestation by indigenous larvae of infected wounds that had resisted ordinary treatment. Natural infestation is found most commonly in members of nomadic camel-owning tribes, an important fact when the frequency of larval infestation of sores on camels is recognised. Larvae from human cases of wound infestation in different parts of the country and specimens collected from camel sores in the neighbourhood of Khartoum all proved to be those of *Wohlfahrtia nuba*, Wied., and this fly was therefore selected for experiment. It was found to be larviparous, the larvae maturing about 2 days after deposition. The flies were kept in screened cages with sterile food, and their larvae were placed on sterile meat in test tubes and kept on ice to inhibit growth until they were needed for treatment of wounds. Cultures made from batches of larvae were found to be uniformly free from pathogenic bacteria. The

production of larvae was adversely affected by dry and cold weather, and measures for artificially raising the humidity and temperature of the cages were found necessary during the winter. The method of applying the larvae to the wound is described. Sterilised wire gauze was fixed over the wound with adhesive strapping, and absorbent wool was arranged to catch the free exudate (which continues as long as the larvae are in the wound) in such a way as not to exclude light. Larvae would not penetrate into a deep sinus in which there was no light, but could be made to enter more deeply by exposing the wound to sunlight. Small sequestra were freed and actually consumed by them in time. Fresh larvae were introduced twice a week, at intervals of two days after removal of the previous batch. As the wound healed fewer larvae were needed ; if too many were used, they destroyed a certain amount of living tissue at the edges of the wound when the available dead tissue had been exhausted. Shortly after the introduction of the first batch of larvae, the wound became alkaline and remained so throughout the treatment. The rapid cleansing of dead tissue from indolent types of wound and the marked stimulation of granulation tissue formation are the outstanding advantages of this method of treatment.

Gibbins (E. G.). **Studies on Ethiopian Simuliidae.** *Simulium damnosum*, **Theo.**—*Trans. R. Ent. Soc. Lond.*, lxxxi, pt. 1, pp. 37–52, 1 pl., 27 figs., 8 refs. London, 30th June 1933.

In view of the existing uncertainty regarding the identity of the male and early stages of *Simulium damnosum*, Theo., and the very brief published account of the female, descriptions are given of the larva, pupa and adults of both sexes from specimens collected in the type locality (near Jinja, Uganda). Brief notes are also given on its bionomics [*cf. R.A.E.*, B, xiii, 167]. In February, when the Nile was low, females were very numerous and active, but in May, when the river had risen considerably, there was a marked diminution in adult prevalence ; it thus appears that its seasonal distribution is affected by fluctuations in the water level. In February this species was also common in the vicinity of the River Sezibwa, but in May it was entirely absent. As this river, except in one small area, did not seem particularly suitable for the early stages, and as careful search at both seasons failed to yield a single larva or pupa, it appears probable that the adults came from the Nile, a flight of about 30 miles.

Harris (W. V.). **Report of the Assistant Entomologist.**—*Ann. Rep. Dept. Agric. Tanganyika 1932*, p. 75. Dar-es-Salaam, 1933.

The seasonal occurrence of blisters on the arms and faces of Europeans in Morogoro in Tanganyika has been found to be due to the Meloid, *Epicauta* (*Cylindrothorax*) *strangulata*, Gerst.

Entomological Division.—*Ann. Rep. Dept. Hlth. Palestine 1932*, pp. 83–84. Jerusalem [1933].

The identifiable fleas taken from rats (*Mus* (*Rattus*) *rattus* and *M.* (*R.*) *norvegicus*) caught at the ports of Jaffa and Haifa during the year comprised 6,907 *Xenopsylla cheopis*, Roths., 109 *Ceratophyllus fasciatus*, Bosc, 550 *Leptopsylla* and 188 *Ctenocephalides* (*Ctenocephalus*).

Davidson (J.). **The Species of Blowflies in the Adelaide District of South Australia and their Seasonal Occurrence.**—*J. Dept. Agric. S. Aust.*, xxxvi, no. 10, pp. 1148–1153, 2 graphs. Adelaide, May 1933.

As little information on the blow-flies occurring in South Australia is available, experiments were carried out in the Adelaide district from September 1931 to the end of August 1932 with two traps, one of which was situated at an altitude of 400 ft. near sheep yards surrounded by trees and close to farm buildings, and the other on the slope of a hill surrounded by trees and shrubs at about 500 ft. The liver used as bait was renewed at intervals of 3–4 weeks, and the flies were removed, identified and counted three times a week. A total of 29,651 flies was taken in the first trap and 7,343 in the second, the numbers of the most important species being 18,585 and 2,865 *Chrysomyia rufifacies*, Macq., 3,847 and 2,380 *C.* (*Microcalliphora*) *varipes*, Macq., 3,774 and 1,790 *Calliphora stygia*, F., 2,130 and 250 *C. nociva*, Hardy, and 1,315 and 58 *Lucilia sericata*, Mg. The last three species are primary, and the first two secondary, flies. Certain other species of *Calliphora* were taken, of which those identified were *C. fulvicoxa*, Hardy, and *C. tibialis*, Macq. The tertiary fly, *Peronia rostrata*, R.-D., was also trapped in large numbers. Brief notes are given on the morphology of the larvae and adults of some of the species.

The seasonal prevalence of the important species is shown in graphs. Data from the trap in which most flies were caught showed that *C. nociva*, *Chrysomyia rufifacies* and *L. sericata* were most prevalent in December, *C. varipes* in April (when *C. rufifacies* reached its second peak), and *Calliphora stygia* at the end of October, but observations made with various traps in different situations showed that a critical analysis of the figures obtained would involve many factors, such as the type of trap, its colour, its situation, the weather conditions, the type of bait and the fly population in the surrounding area (the presence of a carcass in the vicinity resulting in a marked temporary increase).

Mackerras (M. J.) & Freney (M. R.). **Observations on the Nutrition of Maggots of Australian Blow-flies.**—*J. Exp. Biol.*, x, no. 3, pp. 237–246, 24 refs. London, July 1933.

Since *Lucilia cuprina*, Wied., appears to be a more serious pest of sheep in Australia than *L. sericata*, Mg. [*R.A.E.*, B, xx, 163], it seemed advisable that earlier observations and experiments on larval nutrition [xx, 231] should be repeated with this species as well as with *L. sericata* and *Chrysomyia rufifacies*, Macq. The action of the larvae on meat consists in mechanical fragmentation, a liquefaction by digestive enzymes and an indirect action, aiding the growth of proteolytic aerobes by disseminating the organisms throughout the medium, by raising the temperature and by neutralising the acidity of the medium. Growth of the larvae on the living sheep is somewhat more rapid than on carrion. The technique by means of which sterile eggs and cultures of the larvae were obtained is described in detail. Cultures were kept at 31°C. [87·8°F.]. Larvae in a sterile culture grew more slowly than when in the presence of bacteria, but eventually reached full size, pupated and emerged as normal adults. The larvae of both *L. cuprina* and *C. rufifacies* can liquefy and absorb their food without the aid of bacteria. Both they, and *L. sericata* also, secrete

tryptic and peptic enzymes, and at least *L. cuprina* does so from the moment of hatching. Partial development of larvae occurred in sheep dung, wool stained with faeces and the products of keratin hydrolysis. No development took place in clean wool, but complete development occurred in wool containing a gummy crust of dried exudate and in some samples of wool stained with faeces. Moisture, warmth, shelter and aeration are essential for larval development. In addition an alkaline reaction is relatively favourable and an acid one unfavourable. There are normally two stages in the development of a primary strike. During the first stage, from hatching to the time when the larvae attack the skin, they must feed, if at all, on materials already present ; during the second, from the beginning of an actual skin lesion up to full development of the larvae, there is a more or less copious serous exudation, which provides adequate food for full development. Faeces-staining, presence of exudate due to a prior lesion and products of wool hydrolysis were sufficient to carry the larvae through the first stage. Wool hydrolysis on the living sheep is probably not an important factor, but organisms were isolated, which, when growing on a nutrient medium, could disintegrate wool fibre. The part played by bacterial activity in strike is complex, but it appears to consist chiefly in the production of substances that attract the flies and stimulate them to oviposit, and in the provision of food for the initial growth of the larvae, either by rendering assimilable the inert proteins or by causing a skin reaction with a serous exudation.

FINDLAY (G. M.) & ELTON (C.). **The Transmission of Louping Ill to Field Voles.**—*J. Comp. Path.*, xlvi, pt. 2, pp. 126–128, 1 fig., 4 refs. Croydon, June 1933.

In experiments carried out in Britain, the field vole (*Microtus agrestis*) was mechanically infected with louping ill, a virus disease of sheep transmitted by the nymphs and adults of the tick, *Ixodes ricinus*, L. The importance of these rodents in maintaining a supply of the tick, as well as in forming reservoirs of the disease, remains to be determined.

SUBRAMANIAM (T. V.). **The Insecticidal Properties of Indigenous Vegetable Fish Poisons.**—*J. Mysore Agric. Exptl. Un.*, xiii, no. 2, pp. 57–60, 2 figs. Bangalore, 1932. [Recd. July 1933.]

In the course of this paper on the toxicity to a number of insects of various plants used as fish poisons in Mysore, an experiment is described in which a powder of the crude plant material of the Papilionaceous plant, *Mundulea suberosa*, when rubbed on to the skin of cattle, the area being subsequently covered with a piece of gunny, gave 90 per cent. control of lice and fleas in 24 hours. A spray at 5 per cent. dilution was not effective.

ROBINSON (W.). **The Use of Blowfly Larvae in the Treatment of Infected Wounds.**—*Ann. Ent. Soc. Amer.*, xxvi, no. 2, pp. 270–276, 12 refs. Columbus, Ohio, June 1933.

A brief general account is given of the use of larvae of *Lucilia sericata*, Mg., and *Phormia regina*, Mg., in the treatment of infected wounds in the United States, including notes on their rearing, sterilisation, application and action [*cf. R.A.E.*, B, xxi, 174, etc.].

Davis (N. C.). **Notes on some South American Mosquitoes.**—*Ann. Ent. Soc. Amer.*, xxvi, no. 2, pp. 277–284, 6 pls., 12 refs. Columbus, Ohio, June 1933.

In the course of this paper, notes are given on the characters distinguishing the larva of *Anopheles thomasi*, Shannon, from that of *A. kompi*, Edw. (recorded as *Stethomyia nimba*, Theo., in a previous paper [*R.A.E.*, B, xix, 29]) ; on the distribution of *A. maculipes*, Theo., and *A. intermedius*, Chagas ; on the characters distinguishing the larvae of *A. rondoni*, Neiva & Pinto, and *A. strodei*, Root ; and on variation in the larval anatomy of the *Nyssorhynchus* group of Anophelines [*cf.* xvi, 240].

Prado (A.). **Contribuições ao conhecimento dos Culicideos de São Paulo, I–IV.** [Contributions to a Knowledge of the Culicids of S. Paulo.] [*In Portuguese.*]—*Mem. Inst. Butantan*, vi, pp. 191–212, 3 pls., 25 refs. São Paulo, 1931. (With Summaries in English.) [Recd. July 1933.]

Both sexes are described of *Mansonia albifera*, sp. n., and compared with those of *M. albicosta*, Chagas (the male of which is here described for the first time), *M. chrysonotum*, Peryassú, *M. juxtamansonia*, Chagas, and *M. fasciolata*, Lynch Arribalzaga. A list is given of the mosquitos of the suburbs of São Paulo, including *Aëdes scapularis*, Rond., *A. serratus*, Theo., and *A. crinifer*, Theo., the last being considered a valid species on hypopygial and larval characters. The male of *Psorophora discrucians*, Wlk., is described from São Paulo with special reference to the characters of the hypopygium, which differentiate it from *P. varipes*, Coq., *P. lutzi*, Theo., and *P. champerico*, Dyar & Knab. Both sexes of *Uranotaenia ditaenionota*, sp. n., from São Paulo are also described.

Parker (R. R.). **Certain Phases of the Problem of Rocky Mountain Spotted Fever. A Summary of Present Information.**—*Arch. Path.*, xv, pp. 398–429 (reprint, with additions, 32 pp., many refs.). Chicago, Ill., March 1933. [Recd. July 1933.]

Present knowledge on the subject of Rocky Mountain spotted fever in the United States is reviewed, the four sections of the paper dealing with its transmission by ticks, the causal organism (including the virus in the tick), the disease in man and its prevention and control.

Rocky Mountain strains of the virus have been transmitted experimentally by *Dermacentor variabilis*, Say, and *D. reticulatus occidentalis*, Marx, and in the case of the former, stage to stage transmission reported by Dyer, Badger and Rumreich [*R.A.E.*, B, xix, 156, 195, etc.] has been confirmed, and in addition hereditary transmission has been demonstrated. *D. r. occidentalis* occurs throughout a large portion of California and in southern and south-western Oregon. In 1931, tests were carried out with *Rhipicephalus sanguineus*, Latr., and *Amblyomma americanum*, L.; both these species occur in the south-eastern part of the country and both attack man (the former only occasionally). The disease was transmitted from the larval to the adult stage and from the female to the offspring. Of several individuals of *A. americanum*, taken from premises in which a fatal case of what was apparently Rocky Mountain spotted fever had occurred, one induced a reaction in guineapigs indicative of that disease.

Parman (D. C.). **A Box-type Trap to Aid in the Control of Eye Gnats and Blowflies.**—*Circ. U.S. Dept. Agric.*, no. 247, 4 pp., 1 fig. Washington, D.C., November 1932.

Parman (D. C.). **Construction of the Box Type Trap for Eye Gnats and Blowflies.**—*Mimeographed Circ. U.S. Dept. Agric. Bur. Ent.*, E.299, 4 pp., 4 pls., 1 ref. Washington, D.C. [1932.]

In the course of investigations on the control of the eye-gnat, *Hippelates pusio*, Lw., begun in 1928, a box type of trap has been evolved that has been used successfully during two seasons in California, where this pest is extremely troublesome [*cf. R.A.E.*, B, xxi, 38]. It has also been adapted for trapping blow-flies and house-flies. Its main features are the following: large quantities of baits can be used to disseminate odours without requiring the hovering flies to enter the region where these are so concentrated as to be apparently more or less repellent; immature flies breeding in the baits are prevented from escaping; both chemotropic and phototropic responses can be utilised; the trap can be adapted to permit flies to enter it without entering the bait chamber; it can be constructed in sizes large enough to contain large carcasses on ranches where it is not feasible to burn dead animals, and in places where it would be advantageous to use large quantities of garbage for baits until it could be otherwise disposed of. The odours are disseminated by currents of air driven into the bait chamber through the funnel-shaped openings. Investigations also indicated that stirring the baits (especially the liquid baits used for eye-gnats) greatly increases the catch, and in 1930 a simple and inexpensive windmill bait agitator was devised. It may be possible to utilise the trap in breeding a continuous supply of parasites and predators of the flies. In the second paper detailed specifications and instructions are given for making these traps and the bait agitator. The cost of the traps is discussed.

As the traps are intended to attract insects from a distance, they should not be placed in shut-in situations nor exposed to high winds; the most suitable positions are in open groves or thin plantings of trees or shrubs, or on ranges with a moderate low growth of vegetation or open high timber, with one of the two entrances facing away from the prevailing wind. The bait used for the eye-gnat trap was generally 1 lb. beef or pig's liver and 2 oz. urea to 4 U.S. gals. water [xix, 252]. The best catches were made when the bait was partly or wholly covered with water, and where enough water is used to float the baits, the windmill agitator may be employed with advantage. If parasites are not being reared, it has been found advantageous to add one teaspoonful of nicotine sulphate to each U.S. gallon of water as a larvicide.

Botsford (R. C.) & Turner (N.). **Mosquito Control in Connecticut, 1932.**—*Bull. Conn. Agric. Expt. Sta.*, no. 349, pp. 439–444. New Haven, Conn., March 1933.

The season of 1932 was favourable to mosquito control work on the salt marshes in Connecticut, as rainfall remained below normal throughout the breeding season. Details are given of the draining, oiling and repairing operations carried out. Anopheline larvae were found in 63 out of a total of 95 known breeding-places, indicating conditions liable to produce a serious malaria epidemic.

Collections at light traps made during the summer of 1932, reported on by Turner, showed that *Aëdes vexans*, Mg. (*sylvestris*, Theo.) was by

far the most abundant in one locality and *Mansonia* (*Taeniorhynchus*) *perturbans*, Wlk., in another. *Aëdes sollicitans*, Wlk., appeared in small numbers in both localities. Species new to Connecticut taken in the traps were : *Anopheles walkeri*, Theo., *A. crucians*, Wied., *Uranotaenia sapphirina*, O.-S., and *Culex apicalis*, Adams.

Tests with larvicides showed that rotenone with fuel oil was less effective than pyrethrum and highly toxic to fish. A mixture of 5 per cent. naphthalene oil and 95 per cent. fuel oil gave excellent results in laboratory tests. A 2·5 per cent. solution of flake naphthalene in fuel oil emulsified and applied diluted at 1 : 15 was not effective. Flake naphthalene gave good results in the laboratory against the larvae of *Aëdes cantator*, Coq., but was ineffective in the field owing to air-movement, which dispersed the toxic vapour. Pure pyrethrum powder (1 gm. to 3 sq. ft), although highly effective in the laboratory, also gave poor results in the field, owing to the difficulty of making it settle on the water.

RAYNAL (J.) & LE GAC (P.). **Etude sur plusieurs lots de phlébotomes capturés dans différents quartiers de Marseille.**—*Ann. Parasit. hum. comp.*, xi, no. 4, pp. 249–267, 1 map, 4 refs. Paris, 1st July 1933.

Further information is given on collections of sandflies made in Marseilles and its environs in 1932 [*R.A.E.*, B, xxi, 138]. The principal morphological characters of both sexes of *Phlebotomus perniciosus*, Newst., and *P. papatasii*, Scop., are described. Their bionomics appear to be similar to those recorded by Simić in Serbia [xviii, 186]. Amongst other places, *P. perniciosus* was taken in rabbit-hutches and particularly in cement or masonry boxes used for rearing guineapigs, suggesting that these animals were attractive. All the resting-places mentioned were surrounded by gardens and often in the proximity of manure heaps or damp ditches containing decaying vegetation, situations suitable for oviposition and larval development. Methods of collecting and preserving specimens of these sandflies are briefly described.

VAN THIEL (P. H.). **Investigations on the Range and Differentiation of *Anopheles maculipennis* Races and their Bearing on the Existence or Absence of Malaria in Italy.**—*Riv. Malariol.*, xii, fasc. 2, pp. 281–318, 2 pls., 2 figs., 7 graphs, 25 refs. Rome, 1933.

During August and September 1932, the author visited Italy for the purpose of studying races of *Anopheles maculipennis*, Mg., and in this paper discusses the results of his investigations. The surface markings of the eggs, the float index (length of float divided by length of egg), the number of ribs on the floats, the intercostal structure of the floats, the breadth of the egg, the structure of the " end bulbs " and " micropylar process ", the number of eggs, wing-length and maxillary index, and the dental index (maxillary index correlated with wing-length) are dealt with and discussed according to their value in identifying the races distinguished by the author as arising from light dappled-grey eggs (var. *labranchiae*, Falleroni), dark dappled-grey eggs (var. *atroparvus*, van Thiel), dark barred and black eggs (var. *messeae*, Falleroni) and simple banded eggs (var. *basilei*, Falleroni [*R.A.E.*, B, xxi, 136]).

From a study of the description and illustration, the author considers that Falleroni's " grey egg " from the Pontine marshes is undoubtedly the light dappled-grey egg, which is therefore that of var. *labranchiae*, from which the dark dappled-grey egg from north Italy differs slightly. The latter appears to be identical with the egg of var.

atroparvus of Holland, only the dental index of the adult being different in the two countries. Var. *labranchiae* appears to have on an average fewer teeth than var. *atroparvus* with the same wing-lengths.

The author does not consider that var. *messeae* is identical with the typical form of *A. maculipennis*, as occurring in Holland, because no black eggs have been found in that country, neither do the numerous transitional forms between the dark barred and black eggs seen in Italy occur there. Moreover, there are numerous small veins, often branched like a feather, on the intercostal film of the floats of the barred eggs [xxi, 136] of the typical form of *A. maculipennis*, whereas the floats in the dark barred and black eggs of var. *messeae* are generally quite clear with only a single vein, although exceptions may occur. Only twice, in two separate localities, were eggs found that had more pronounced branching of the veins between the costae, and it is suggested that these may indicate the existence of the typical form in Italy.

In Orti di Schito, 100 per cent. of the eggs were of the simple banded type (var. *basilei*) [*cf.* xx, 58]. Falleroni originally placed these eggs with the grey eggs, but later considered them related to the dark eggs [xiv, 16], and it seems probable that Falleroni's use of two names [var. *messeae* and var. *labranchiae*] for three types of eggs led Martini, Missiroli and Hackett to attribute the simple banded eggs to the typical form of *A. maculipennis* [xx, 58]. Adults of var. *basilei* are very zoophilous. Larvae were found in the fresh water of ditches in cultivated arable land. The prevalence of this type of egg does not appear to be due to specific conditions of temperature, since it was found at localities further north and south. The intercostal film of the simple banded eggs is veined like that of the light dappled-grey egg (var. *labranchiae*), the veins being feathered as in the egg of the typical *A. maculipennis* but to a less degree. The number of ribs is greater and the float is larger than in the dark barred and black eggs (var. *messeae*).

With reference to the statement of Ottolenghi and others [xvii, 196] that in certain districts of Ferrara where there is little malaria, the mosquitos are smaller than in districts where malaria is more severe, the author points out that in Italy the short-winged mosquitos that are dangerous as malaria vectors are those having light dappled-grey eggs, whereas those taken at Yolanda (where there is little malaria) were those having dark dappled-grey eggs. The severe malaria occurring in Gorino, on the other hand, is probably not due to the presence of *A. maculipennis* (which here belongs chiefly to the type with dark barred and black eggs, with some of those with dark dappled-grey eggs) but to *A. sacharovi*, Favr (*elutus*, Edw.), which is not present at Yolanda.

The author confirms the observations of Italian authors that there is a marked correlation between the incidence of malaria and the presence of mosquitos with light dappled-grey eggs [xx, 58], more particularly since in those parts of north Italy where there is no malaria, no mosquitos with light dappled-grey eggs were found.

In order to prove the presence of biological races in Italy, it is chiefly necessary to rear mosquitos with different types of eggs under identical laboratory conditions for several generations, and to note whether those with dark dappled-grey eggs lay light dappled-grey eggs at a higher temperature. If, as previous observations suggest, the mosquitos with light dappled-grey eggs prefer more brackish water for

oviposition than the other types, account must be taken of this fact in malaria campaigns [*cf.* xxi, 139]. Malaria has disappeared near Viareggio, where sluices have been constructed to prevent the sea water from entering the river. Investigations into the subject of races of *A. maculipennis* have demonstrated the value of the theory of Hackett and Missiroli [xix, 68, 107] that there exist zoophilous and anthropophilous strains, but the author does not consider that their explanation of the replacement of one strain by another is correct. He believes that such a phenomenon can only take place when conditions in the breeding-places change (brackish water becoming fresher and thus favouring the breeding of the zoophilous strain) and many cattle are present.

Metzel (K.). **Schädlingsbekämpfung im Bahnbereiche.** [The Control of Pests in Railway Work.]—Demy 8vo, 86 pp. Berlin, Verkehrsw. Lehrmittelges. deuts. Reichsbahn, 1933. Price *M*.1.50.

This booklet, which is written for practical workers, deals with the control of a variety of insects such as cockroaches, bugs, moths, mosquitos, flies, fleas, ants, etc. The ground covered comprises the damage done, methods and organisation of control, and lists of pests, with practical notes on the measures required and the precautions needed when applying them.

Janisch (E.). **Beobachtungen bei der Aufzucht von Bettwanzen. i. Ueber das Verhalten von Populationen bei verschiedenen Zuchtbedingungen.** [Observations during Experiments in breeding Bed-bugs. i. On the Behaviour of Populations under varied Breeding Conditions.]—*Z. Parasitenk.*, v, no. 3–4, pp. 460–514, 23 figs., 15 refs. Berlin, 20th May 1933.

The following is largely taken from the author's summary of these investigations on *Cimex lectularius*, L. Great differences were found in the course of development, in pre-imaginal mortality, in egg-production, in the longevity of adults and in the mortality and date of hatching of their offspring. Attention, food, temperature and moisture influenced the behaviour of the different populations. Observation of the entire individual cycle from egg to adult death showed many connections between the behaviour of the parent generations and of their offspring. The weakest individuals reacted more to environmental injury than the stronger ones and suffered greater retardation in development therefrom. Breeding conditions influenced the health and longevity of the parents, which in turn influenced the general conditions of the populations. The exposure of eggs (or, to a much less degree, of larvae) to 40°C. [104°F.] notably increased pre-imaginal mortality and reduced egg-production by the survivors. The effect, however, on the mortality of the offspring of the more vigorous females (which was inversely correlated with the longevity and egg-production of the latter) was independent of the stage at which this exposure occurred.

Peus (F.). **Transport von Mallophagen durch Stechmücken.** [Transport of Mallophaga by Mosquitos.]—*Z. Parasitenk.*, v, no. 3–4, pp. 740–741, 1 fig. Berlin, 20th May 1933.

Two cases are recorded from different parts of Germany of the transport of lice by mosquitos. In one case *Aëdes intrudens*, Dyar, was

carrying *Trichodectes tibialis*, Piag., which attacks roe and fallow deer, and in the other *A. rusticus*, Rossi, was transporting a louse that was almost certainly the same species. In both instances the lice were attached to the labium of the mosquito, which thus served as an effective vector of them from one animal to another.

Blijdorp (P. A.). **Rapport inzake het onderzoek der vliegenplaag op de stortplaats van het Haagsche stadsvuil te Wijster, uitgebracht aan de V.A.M. einde Augustus 1932.** [Report submitted at the end of August 1932 to the Refuse Removal Company on Investigations on Flies at the Hague Town Refuse Dump at Wijster.]—*Versl. PlZiektenk. Dienst*, no. 71, 16 pp., 3 figs. Wageningen, June 1933.

These investigations were made at a newly established refuse dump where the contents of railway waggons are deposited and left until composted. *Musca domestica*, L., predominated, but *Calliphora* and *Lucilia* were also present. In calm weather the flies travelled to a distance of about 3 miles from the dump and much greater distances to leeward in windy weather. They developed chiefly from eggs laid at the dump itself. Fermentation began in the waggons, and at a depth of 12 inches there were temperatures of 65–70°C. [149–158°F.], which precluded larval life. It was found that larvae could live at temperatures up to 55°C. [131°F.], the optimum being between 45 and 50°C. [113 and 122°F.], while at 55–60°C. [131–140°F.] they survived for some time. The temperature of cold refuse soon rose to 70°C. when it was covered with a 6-inch layer. Over half the larvae died under an 8-inch layer, and all died under 12 inches. The effect of moisture was not studied. The high temperature of 35–40°C. [95–104°F.] in the uppermost layers shortened the egg-stage to about 9 hours and the larval to about 1 day. Pupation lasted about 3–4 days, so that adults appeared in about a week.

As a control measure, the refuse should not be distributed over a wider area than is absolutely necessary. A poison-bait for the adults that is recommended for spraying the refuse is a solution of 1½–2 per cent. sodium fluoride sweetened with 20 per cent. sugar, 90–135 gals. being required per acre.

Baudet (E. A. R. F.) & Nieschulz (O.). **Over myiasis bij schapen veroorzaakt door larven van** *Lucilia sericata*. [On Myiasis in Sheep due to Larvae of *L. sericata*.]—*Tijdschr. Diergeneesk.*, lx, no. 11–12, reprint 19 pp., 1 pl. The Hague, 1933.

Baudet (E. A. R. F.) & Nieschulz (O.). **Ueber Fliegenlarven-infektionen** (*Lucilia sericata*) **bei Schafen im Wieringermeerpolder (Zuiderzeegebiet).** [On Infestation of Sheep by the Maggots of *L. sericata* in the Wieringen Polder, Zuyder Zee district.]—*Z. angew. Ent.*, xx, no. 2, pp. 324–325. Berlin, July 1933.

On the "polder" [land reclaimed from the sea] at Wieringen, drained in 1931, the majority of 1,200 sheep were found in the summer of 1932 to be infested by *Lucilia sericata*, Mg., and as the placing of 20,000 on the area was contemplated, this pest and its control are being investigated. Some biological observations were made during breeding experiments at a temperature of 26°C. [78·8°F.] with moisture maintained by the constant evaporation of water. The egg stage lasted 1 day, the larval 5–6, and the pupal at least 7. A brief description of all

stages is given. In the authors' experiments the dressing recommended by Smit in South Africa [*R.A.E.*, B, xx, 37] proved satisfactory against full-grown larvae, but less so against young (3-day-old) larvae, possibly owing to the protection afforded by the envelope of slime not found on older ones. Very young larvae with only 2 stigmata in each tracheal opening were very resistant to the insecticide. Undiluted chloroform or carbon tetrachloride was very efficient, but these would be difficult to use in practice. Pine tar oil mixed with oil of turpentine and methylated spirits (equal parts of all 3) nearly always killed the larvae with 3 stigmata. A smaller proportion of the pine tar oil was unsatisfactory. Whether the mixture is too irritant for the sheep has not yet been investigated. A mixture containing equal quantities of oil of turpentine and methylated spirits and 10 per cent. tar killed the larvae after 1 minute in several experiments. A preparation recommended against *Hypoderma bovis*, DeG., containing 10 per cent. tar, with turpentine oil, common turpentine, petrol, methylated spirits and soft-soap, killed the larvae after at least 2½ minutes. The tar was the active ingredient, and the soft-soap retarded its action rather than assisting it. Neither derris powder nor its active constituent, rotenone, had any effect.

MITSUHORI (Saburo). **A Study on the Destruction of a House-infesting Tick** (*Liponyssus nagayoi*).—*J. Publ. Hlth. Ass. Japan*, viii, no. 11, pp. 1–4. November 1932. (Abstr. in *Trop. Dis. Bull.*, xxx, p. 316. London, 1933.)

The mite, *Liponyssus nagayoi*, Yamada, which attacks man [*R.A.E.*, B, xix, 156], has become increasingly prevalent in the town of Nagoya, Japan, during recent years. In experiments on its control, the most effective results were obtained with volatile chemicals, such as carbon bisulphide, chloroform, benzene or chloropicrin.

PAPERS NOTICED BY TITLE ONLY.

MONTEIRO (J. L.). **Estudos sobre o typho exanthematico de São Paulo.** [Studies on Exanthematic Typhus of S. Paulo.] [*In Portuguese.*] —*Mem. Inst. Butantan*, vi, pp. 3–135, 6 pls., 54 graphs, 67 refs. São Paulo, 1931. (With a Summary in English.) [Recd. July 1933.] [*Cf. R.A.E.*, B, xxi, 67.]

MONTEIRO (J. L.), FONSECA (F. da) & PRADO (A.). **Pesquisas epidemiologicas sobre o typho exanthematico de São Paulo.** [Epidemiological Studies on Exanthematic Typhus of S. Paulo.] [*In Portuguese.*]—*Mem. Inst. Butantan*, vi, pp. 137–172, 1 pl., 10 graphs, 17 refs. São Paulo, 1931. (With a Summary in English.) [Recd. July 1933.] [*Cf. R.A.E.*, B, xxi, 67.]

SCHUURMANS STEKHOVEN (J. H.). **Résultats scientifiques du voyage aux Indes orientales néerlandaises de LL. AA. RR. le prince et la princesse Léopold de Belgique. Diptera. Tabanidae.** [Including 3 new species.]—*Mém. Mus. Hist. nat. Belg.*, iv, fasc. 7, hors série, pp. 11–16, 3 figs., 1 ref. Brussels, 31st December 1932.

DUNN (L. H.). **Two New Species of Ticks from Panama** (*Amblyomma tapirellum* and *A. pecarium*).—*Parasitology*, xxv, no. 3, pp. 353–358, 4 figs. Cambridge, 1st July 1933.

RAY (Harendranath). **On the Gregarine,** *Lankesteria culicis* **(Ross), in the Mosquito,** *Aëdes* (*Stegomyia*) *albopictus* **Skuse** [in India].—*Parasitology*, xxv, no. 3, pp. 392–396, 1 pl., 13 refs. Cambridge, 1st July 1933.

CHOPARD (L.). **Une blatte** [*Phyllodromia* (*Supella*) *supellectilium*, Serv.] **récemment acclimatée en France.**—*Ann. Soc. ent. Fr.*, cii, p. 172. Paris, 1933.

SCHWARTZ (B.), IMES (M.) & WRIGHT (W. H.). **Parasites and Parasitic Diseases of Horses.**—*Circ. U.S. Dept. Agric.*, no. 148, 54 pp., 36 figs., 3 refs. Washington, D.C., January 1933. [See *R.A.E.*, B, xix, 98.]

KOMP (W. H. W.). **A new Culex,** *Culex vomerifer*, **from Panama (Dipt., Culicidae).**—*Psyche*, xxxix, no. 3, pp. 79–82. Cambridge, Mass., September 1932. [Recd. July 1933.]

KOMP (W. H. W.) & CURRY (D. P.). **A new Culex** [*Culex* (*Upsiloporpa*) *haynei*] **from Panama (Dipt., Culicidae).**—*T.c.*, pp. 82–84. Cambridge, Mass., September 1932. [Recd. July 1933.]

GRIFFITTS (T. H. D.). **Observations et expériences nouvelles sur le transport des moustiques par les aéroplanes.**—*Bull. Off. int. Hyg. publ.*, xxv, no. 6, pp. 1024–1027, 2 refs. Paris, June 1933. [*Cf. R.A.E.*, B, xxi, 183.]

HASE (A.). **Ueber Starrzustände bei blutsaugenden Insekten, insbesondere bei Wanzen. ii. Mitteilung betr.** *Panstrongylus* (*Triatoma*) *geniculatus* **Pinto 1931.** [On Cataleptic Positions in Blood-sucking Bugs. ii. Contribution on *P. geniculatus*, Latr.]—*Z. Parasitenk.*, v, no. 3–4, pp. 708–723, 8 figs., 34 refs. Berlin, 20th May 1933.

ELLSWORTH (J. K.). **The Photoreceptive Organs of a Flesh Fly Larva** *Lucilia sericata* **(Meigen) : An Experimental and Anatomical Study.**—*Ann. Ent. Soc. Amer.*, xxvi, no. 2, pp. 203–215, 1 pl., 1 fig., 17 refs. Columbus, Ohio, June 1933.

HALL (D. G.). **A new Species of Sarcophaga** [*Sarcophaga polistensis*] **inhabiting Nests of Paper Wasps** [*Polistes texanus*, Cress.].—*Proc. Ent. Soc. Wash.*, xxxv, no. 6, pp. 110–111, 1 fig. Washington, D.C., June 1933.

TRENSZ (F.). **Etude expérimentale sur la fonction des chambres à air de l'oeuf d'***Anopheles maculipennis*.—*Arch. Inst. Pasteur Algérie*, xi, no. 2, pp. 192–197, 1 pl., 13 refs. Algiers, 1933.

NIESCHULZ (O.). **Ueber die Puppe von** [The Pupa of] *Tabanus biguttatus* **Wied.**—*Zbl. Bakt.*, (2) lxxxviii, pp. 141–144, 1 fig., 7 refs. Jena, 1933.

RUSER (M.). **Beiträge zur Kenntnis des Chitins und der Muskulatur der Zecken (Ixodidae).** [Contributions to a Knowledge of the Chitin and Muscles of Ticks.]—*Z. Morph. Oekol. Tiere*, xxvii, no. 2, pp. 199–261, 39 figs., many refs. Berlin, 1933.

SCHULZE (P.). **Ixodidae der deutschen limnologischen Sunda-Expedition.** [Ixodidae of the German Limnological Expedition to the Sunda Islands.]—*Arch. Hydrobiol.*, Suppl.-Bd. xii, *Trop. Binnengewässer*, iv, pp. 490–502, 12 figs., 12 refs. Stuttgart, 1933.

JOSEPH (G.). **La lutte anti-stégomyienne à Dakar.**—*Bull. Off. int. Hyg. publ.*, xxv, no. 6, pp. 1021–1023. Paris, June 1933.

An investigation of the breeding-places of *Aëdes* (*Stegomyia*) [*aegypti*, L.] at Dakar, Senegal, in 1931 indicates that in quarters where there is a supply of running water in pipes the mosquitos show a tendency to disappear. The great majority of breeding-places are found where insufficient development of the water-supply or inadequate distribution of drinking water renders the keeping of a reserve supply necesary. The sudden development of the town of Dakar after the War, involving a rapid increase in the population and in the number of ships calling at the port, rendered a correspondingly rapid extension of the water-supply difficult, particularly as a scarcity of rain made rationing necessary. A new scheme has now been developed which is designed to overcome this.

ANDRÉ (M.). *Thrombicula autumnalis* **Shaw ou** *T. russica* **Oud. ?**—*Bull. Soc. ent. Fr.*, xxxviii, no. 10, pp. 154–156, 2 figs. Paris, 1933.

The author disagrees with a statement recently made by H. Vitzthum that the only species of Trombidiid mite occurring on bats is *Trombicula russica*, Oud., and believes that the larvae that were found on a bat in northern France in May 1930 and subsequently transformed into nymphs, must have been *T. autumnalis*, Shaw [*R.A.E.*, B, xx, 228]. The morphological characters of the larvae of these two species are discussed. *T. autumnalis* has also been recorded on bats as far back as 1913, and the nymphal stage, which is usually reached about mid-October [xviii, 127], may also occur in May–June, the larvae having overwintered on the host. *T. russica* has also been found on a field rat, and larvae were observed not only in January–March, but in September–December as well.

NICOLLE (C.), LAIGRET (J.) & GIROUD (P.). **Passage des virus des fièvres exanthématiques par la voie digestive chez le rat.**—*C. R. Acad. Sci. Fr.*, cxcvi, no. 4, pp. 225–227.

NICOLLE (C.), LAIGRET (J.) & GIROUD (P.). **Transmission du typhus murin par piqûres et ingestion de puces infectées.**—*Op. cit.*, cxcvii, no. 5, pp. 377–378, 1 ref. Paris, 1933.

In view of the fact that in nature rats devour other small rodents with their ectoparasites, investigations were carried out to determine whether the virus of fevers carried by the latter could pass through the wall of the digestive tract.

The first paper gives the results of feeding rats on the brain of guineapigs infected with the virus of various forms of typhus. In all cases infection resulted. It is probable, therefore, that in nature murine typhus commonly passes from rat to rat both by ingestion of infective insect parasites and by cannibalism among the rats.

The second paper gives the result of experiments in which fleas, *Xenopsylla cheopis*, Roths., infected with Toulon murine typhus by feeding on infected guineapigs for 4 days, were kept for 8 days on a monkey (*Macacus rhesus*). Of those that remained alive, half were crushed and inoculated under the skin of guineapigs, and the other half were mixed with bread and fed to rats. The monkey, the guineapigs and the rats were all infected with an inapparent form of fever, which rendered them immune from further infection.

FENG (Lan-Chou). **Some Parasites of Mosquitoes and Flies found in China.**—*Lingnan Sci. J.*, xii, Suppl., pp. 23–31, 1 pl., 1 fig., 14 refs. Canton, 22nd May 1933.

The following parasites of mosquitos have been observed in various parts of China :—the Gregarine, *Lankesteria culicis*, in *Aëdes japonicus* var. *koreicus*, Edw., *A. albopictus*, Skuse, and *Armigeres obturbans*, Wlk., but not in *Anopheles* or *Culex* ; the flagellate, *Herpetomonas culicis*, in *Anopheles minimus*, Theo., and *A. hyrcanus* var. *sinensis*, Wied ; oöcysts of a *Coccidium*, similar to those found in the Philippines [*R.A.E.*, B, xviii, 209], in *A. hyrcanus* var. *sinensis* and *Culex tritaeniorhynchus*, Giles ; Trematode cysts in *A. minimus* ; and larvae of a Hydrachnid mite on *A. hyrcanus* var. *sinensis*, with tubular processes at the place of attachment like those observed on infected *Aëdes* [xvii, 183]. *Musca domestica*, L., in Amoy is frequently infested with an unidentified red mite. Pupae of *Lucilia sericata*, Mg., and *Sarcophaga* sp. were parasitised, probably by a Pteromalid, *Mormoniella* (*Nasonia*) sp.

CHEN (H. T.). **On a Method of expelling disintegrated Tapeworms in** *Ctenocephalides felis*.—*Lingnan Sci. J.*, Suppl., xii, pp. 43–48, 8 refs. Canton, 22nd May 1933.

In experiments with the tapeworm, *Dipylidium caninum*, in *Ctenocephalides felis*, Bch., it was found that cysticercoids in the body-cavity of immature or adult fleas may become enclosed in a capsule by the action of the leucocytes and generally transformed into a yellow pigment. The process by which this pigment is excreted, chiefly by passage through the epithelium of the mid-gut, is discussed.

PARROT (L.), DONATIEN (A.) & LESTOQUARD (F.). **Notes et réflexions sur la biologie de** *Phlebotomus perniciosus* **Newstead en Algérie.**—*Arch. Inst. Pasteur Algérie*, xi, no. 2, pp. 183–191, 1 diagr., 20 refs. Algiers, 1933.

Phlebotomus perniciosus, Newst., which is the probable vector of visceral leishmaniasis of man and dog in north Africa [*cf. R.A.E.*, B, xix, 217], is found throughout the coastal and high plateau areas of Algeria, where it is the most widespread species, *P. sergenti*, Parr., *P. papatasii*, Scop., and *P. parroti*, Adl. & Thdr., being generally less abundant. It has not been recorded from the Algerian Sahara. On the coast, the adults usually appear about 15th May and are present until the first days of November ; on the high plateaux, they do not appear until about the beginning of June and disappear again about mid-October. The females are most prevalent in June-July and again at the end of September and beginning of October, so that there are two generations a year, the second of which is the more abundant. The predominance of the second generation was also observed in the high plateau region. Although it bites man readily, *P. perniciosus* shows a marked preference for dogs, and there is a striking contrast between the number of engorged females found in kennels and the number found seeking man in neighbouring houses. This would seem to explain why visceral leishmaniasis of dogs is more frequent than that of man in Algeria and in the western part of the Mediterranean basin, and why in newly invaded districts the malady may occur in dogs for long periods before it appears in man. In Marseilles, the disease in dogs was known for 8 years before the first case occurred in man. Since,

like all sandflies, *P. perniciosus* bites only smooth or slightly hairy parts of the skin, dogs that have large sores, ulcers, etc., and so present the largest areas accessible to the insects, are the most important reservoirs of *Leishmania*. In the laboratory it has not been found possible to feed this species on white mice or geckos (*Tarentola mauritanica*). The larvae were readily reared on dry leaves of trees, such as *Ulmus campestris* [*cf.* xxi, 21]. Moreover, when leaves were placed above a mixture of earth and dried blood [*cf.* xxi, 19], the larvae left the mixture and devoured the leaves. This habit of the larvae explains why in towns this species (and others of the same genus) is found chiefly on the outskirts or near parks and gardens, and, indirectly, why cases of infantile kala-azar have been observed in the country rather than in towns and why, when they occur in towns, they are nearer the periphery than the centre. At 22–24°C. [71·6–75·2°F.] the life-cycle of *P. perniciosus* from egg to adult lasts from 134 to 216 days.

SENEVET (G.). **Notes sur les moustiques.—II.**—*Arch. Inst. Pasteur Algérie*, xi, no. 2, pp. 198–207, 4 figs., 4 refs. Algiers, 1933.

Descriptions are given of the pupae of *Anopheles algeriensis*, Theo., *A. broussesi*, Edw., and *A. rhodesiensis*, Theo. The pupa described by Kirkpatrick as that of *A. rhodesiensis* in a paper already noticed [*R.A.E.*, B, xiv, 14] was probably that of *A. d'thali*, Patt., which was at one time considered to be a synonym of the former species [*cf.* iii, 212 ; xix, 174].

BRUNELLI (G.). **La fossa circondaria e la bonifica idrobiologica.** [The "surrounding Channel" and hydrobiological Measures against Malaria.]—*Atti R. Accad. naz. Lincei*, Rend. Cl. Sci. fis., mat. nat., xvii, no. 8, pp. 671–674. Rome, 1933.

In dealing with brackish pools common along the coasts of Italy, the old method of complete drainage has been replaced by that of improving their communication with the sea, thus increasing their salinity, banking up their edges, clearing them of weeds, and stocking them with fish. A high salt-content of 20 per mille renders ponds and lagoons used as sources of fish supply unsuitable for all Anophelines except *Anopheles sacharovi*, Favr (*elutus*, Edw.) which must be combated by weeding, etc. A "valle," or fishing area fenced or banked off in a lagoon [*R.A.E.*, B, xviii, 111] and divided by banks into several sheets of water, may be rendered non-malarious by a channel dug in it along its edges so as to link up the divisions and promote the flow of water in them. In pools with water of little salinity, such a channel, if about 6–7 feet deep, will prevent the growth of reeds and consequent silting. These channels are usual in the fishing areas or "valli" in Venetia, and their use in connection with other coastal pools or lagoons has given good results.

MATHIS (C.) & BERLAND (L.). **Une araignée domestique africaine : *Plexippus paykulli*, ennemie naturelle des *Stegomyia*, hôtes des maisons.**—*C. R. Acad. Sci. Fr.*, cxcvii, no. 3, pp. 271–272. Paris, 1933.

When breeding *Aëdes aegypti*, L., at Dakar, the authors found a marked discrepancy between the numbers of larvae and of adults in

spite of optimum conditions. Investigation showed this to be due to the spider, *Plexippus paykulli*, which preyed upon the mosquitos resting on the wire mesh of the breeding-cages. It is suggested that this spider might be of importance in control.

NÖLLER (W.). **Ueber eine kleinhöhlenbewohnende deutsche Zecke und ihren Wirt.** [On a German Tick found in small Burrows and its Host.]—*SitzBer. Ges. naturf. Fr. Berlin*, 1932, pp. 374–377, 11 refs. Berlin, 1933.

The tick, *Ixodes hexagonus*, Leach, is recorded from rabbits in Thuringia. It has only previously been recorded from this host in America.

TOUMANOFF (C.). **Recherches sur la fréquence saisonnière de diverses espèces anophéliennes au Tonkin (Bassin du Fleuve Rouge). Première note : *A.* (*Myz.*) *minimus* Théo. et *A.* (*Myz.*) *aconitus* Dön. Deuxième note : *A.* (*Pseudomyzomyia*) *vagus* Dön.**—*Bull. Soc. Path. exot.*, xxvi, no. 6, pp. 857–863, 1 diagr., 3 refs ; pp. 863–867, 2 diagrs., 5 refs. Paris, 1933.

The seasonal distribution of *Anopheles minimus*, Theo., *A. aconitus*, Dön., and *A. vagus*, Dön., in the basin of the Red River, Tonkin, is discussed in detail. *A. minimus* is most prevalent during the winter monsoon period (November to March), particularly from January to March ; it is less prevalent during the transition periods in April and October, and during the summer monsoon (rainy season), its numbers fall to about a third of those present during the winter. This diminution is believed to be due largely to the action of the rains in increasing the current or raising the water level in the streams, drains, etc., that are the normal breeding-places of this species [*cf. R.A.E.*, B, xx, 203]. Its prevalence in the dry season coincides with the maximum incidence of infection of its glands with malaria parasites. *A. aconitus* is also more abundant during the winter monsoon than during the summer, but reaches its maximum during November–December. *A. vagus*, on the other hand, is most numerous during the last part of the rainy season in August and September and reaches its minimum during the last part of the winter monsoon (January–March). The increase of this species during the rainy season is obviously due to its preference for breeding in stagnant pools [*loc. cit.*], which are then far more extensive, and to the rapidity of its larval development during the summer months [*cf.* xx, 62]. Two cases of natural infection in this species were recorded in June and July, and it is suggested that infection was brought about by a temporarily closer relation with man due to the increased abundance of the mosquito.

LEGENDRE (F.). **Rapport sur l'état actuel de l'endémie palustre à Fianarantsoa.**—*Bull. Soc. Path. exot.*, xxvi, no. 6, pp. 884–888. Paris, 1933.

In the malaria survey of this town in Madagascar, the Anophelines found were *A. gambiae*, Giles (*costalis*, Theo.), which was very abundant, and *A. squamosus*, Theo. Whereas in the new quarter, situated on a height, the mosquitos are so rare that the Europeans have largely abandoned the use of mosquito nets, in other parts numerous adult

mosquitos, nearly all *A. gambiae*, may be caught at nightfall in native and European dwellings and even in certain of the hospital buildings. The growing of rice within the town limits has been forbidden, but the old rice-fields, left to themselves or insufficiently drained, abound in springs, water from which spreads through the thin layer of arable soil that lies on a stratum of impermeable laterite and so creates breeding-places particularly favourable to larvae that prefer clear water with little current and sparse horizontal vegetation, such as is provided by the couch grass that is prevalent in these areas. Where the ground is hilly, the drainage system should be extended and improved, and old rice-fields should be made into vegetable gardens with a limited number of reservoirs for conserving irrigation water.

VAUCEL (M.). **Les acquisitions nouvelles dans l'étude des trypanosomiases.**—*Ann. Méd. Pharm. colon.*, xxxi, no. 1, pp. 25–63. Paris, 1933.

In the course of this general review of present knowledge on the subject of trypanosomiasis of man and animals, the author deals with the relation of the various species of *Glossina* to the transmission of the disease.

ALEXANDER (R. A.) & NEITZ (W. O.). **The Transmission of Louping-ill of Sheep by Ticks** (*Rhipicephalus appendiculatus*).—*Vet. J.*, lxxxix, pp. 320–323, 2 charts, 5 refs. London, July 1933.

With a view to facilitating the control of certain virus diseases of domesticated animals in South Africa, a comparative study was carried out with louping-ill of sheep, the virus of which is easily transmitted to mice and immunity to which is developed in the recovered animal. An experiment in which louping-ill was successfully transmitted by means of *Rhipicephalus appendiculatus*, Neum., constitutes direct experimental evidence of the association of the disease with ticks other than those of the genus *Ixodes*. The virus used was imported into S. Africa in the form of a desiccated powder of infected sheep brain. The ticks used were the progeny of several *R. appendiculatus* collected as fully engorged females from cattle that were known to have been in normal health for many months. The experiments are described in detail. Numerous larvae were placed on the ears of artificially infected sheep as soon as the first rise in temperature was recorded. Daily observations showed that engorgement was proceeding normally, and about 800 engorged larvae were obtained on the 9th day. They were placed in test tubes stoppered with cottonwool, and when they had reached the nymphal stage, another sheep was infested on both ears with about 80 of them, which attached themselves readily. Its temperature rose abruptly to 106°F., five days after tick infestation, and when blood drawn on the second day of fever was injected intracerebrally into mice, they all showed typical symptoms of paralysis and died after 4–6 days. This experiment was repeated with similar results, the sheep concerned showing typical louping-ill reactions to which it succumbed.

The virulence of the virus appeared to be considerably enhanced after passage through the tick, since four sheep infected by subcutaneous injection of an emulsion of infective ticks all died, whereas

subcutaneous injection of infective brain emulsion is followed by fever but not usually by death. As there was, moreover, no evidence of transmission of "tick-borne fever" [*cf. R.A.E.*, B, xx, 206], it would seem that, with *R. appendiculatus* as the vector, that disease is not necessary for the appearance of symptoms of nervous derangement.

CUTHBERTSON (A.). **The Habits and Life Histories of some Diptera in Southern Rhodesia.**—*Proc. Rhodesia Sci. Ass.*, xxxii, pp. 81–111, 4 pls., 6 figs., 9 refs. Salisbury, 1933.

Detailed notes, supplementary to those contained in a paper already noticed [*R.A.E.*, B, xx, 188], are given on a number of flies of Southern Rhodesia, mainly Muscids and species attacking cattle. In many cases descriptions and life-history data are also given.

In an appendix by Miss D. Aubertin, the distinguishing characters of the following myiasis-producing species are given: *Chrysomyia albiceps*, Wied., *C. putoria*, Wied., *Lucilia cuprina*, Wied., and *L. sericata*, Mg.

JACK (R. W.). **Report of the Chief Entomologist for the Year ending 31st December, 1932. Medical and Veterinary.**—*Rhodesia Agric. J.*, xxx, no. 7, pp. 569–581. Salisbury, S. Rhodesia, July 1933.

The present situation with regard to tsetse-fly in Southern Rhodesia and the control work carried out during the year are briefly reviewed.

The policy of game destruction has had to be continued owing to the unremitting tendency of *Glossina morsitans*, Westw., to spread to its former limits, which are probably climatic. Its previous range is known to have covered nearly half the Colony, and, provided that the animals on which it feeds are sufficiently abundant, reinfestation of the whole of this area is to be anticipated as the natural course of events. The game reduction cordon completed round the limits of the fly area in 1929 [*cf. R.A.E.*, B, xviii, 218], with the exception of a short section between the Shangani and Zambesi Rivers in the west, appears to be achieving its general object of preventing further spread of the fly; there has been no record of a definite advance during the past two years, except in the small section mentioned above where it has so far not proved feasible to undertake effective operations. In areas where an attempt is being made to drive back the fly, definite success has been attained in the Lomagundi (Umboe) section [*cf.* xxi, 28]; the position in the Lomagundi (South West) section is satisfactory, and in the difficult area included in the Gatooma Sub-district, the fly is definitely receding, and there are indications that the position in certain parts of the occupied area is improving [*cf.* xix, 179]. Experience elsewhere having indicated that a ten-mile game-free buffer zone is not wide enough to produce satisfactory results from game elimination, operations in the Gatooma area were extended for ten miles to the west of the western fence. Financial considerations prevented the erection of another fence, but the number of native hunters was doubled in order to cover the increased area. No improvement in the Wankie District is reported, and there has been an increase in the number of cases of trypanosomiasis in this area. The situation in the areas under native control is briefly reviewed. A slight extension of the fly is thought to have taken place in one district where deaths among cattle have been numerous, but natives have also moved their cattle considerably

nearer to the infested area during the past two years. Details are given of the number of flies taken at various traffic control stations from cars, cyclists and pedestrians.

The wooded valleys of several rivers cross the border between Southern Rhodesia and Portuguese East Africa, and as it is along these rivers that tsetse-flies (*G. pallidipes*, Aust., and *G. brevipalpis*, Newst.) are most likely to enter the Colony, experimental clearings are being made in an attempt to break this connection with the infested forest area in Portuguese East Africa.

Experiments with fly-traps of the Harris and similar types [xix, 78] carried out throughout 1932 showed that catches were only considerable at certain times of the year, and then the numbers were too small to indicate that any practical benefit would result from their use. Analysis of available data suggests that the failure of the traps against *G. morsitans* under the climatic conditions prevailing is due to the differences in habit between this species and *G. pallidipes* rather than to details in the design of the traps.

Myiasis of cattle due to infestation of wounds with maggots of *Chrysomyia bezziana*, Villen., is a factor that continues to affect adversely the ranching industry.

BADGER (L. F.). **Rocky Mountain Spotted Fever : Susceptibility of the Dog and Sheep to the Virus.**—*Publ. Hlth. Rep.*, xlviii, no. 27, pp. 791–795, 1 diagr. Washington, D.C., 7th July 1933.

Infected individuals of *Dermacentor venustus*, Banks (*andersoni*, Stiles) transmitted Rocky Mountain spotted fever to two puppies, which showed clinical symptoms after incubation periods of 5 and 6 days, and the virus was recovered from both of them on sub-inoculation into guineapigs.

WORKMAN (W. G.). **Typhus Fever. Experimental Transmission of Endemic Typhus Fever of the United States by** *Xenopsylla astia*.—*Publ. Hlth. Rep.*, xlviii, no. 27, pp. 795–797, 4 refs. Washington, D.C., 7th July 1933.

A detailed account is given of successful experiments which demonstrated that *Xenopsylla astia*, Roths., can act as a vector of the endemic typhus fever of the United States under experimental conditions as has already been shown to be the case with *X. cheopis*, Roths., and *Ceratophyllus fasciatus*, Bosc [*R.A.E.*, B, xix, 257 ; xx, 143].

SANBORN (C. E.). **Insect Pest Studies.**—*Rep. Oklahoma Agric. Expt. Sta. 1930–32*, pp. 244–248. Stillwater, Okla. [1933.]

Insect pests of livestock that have been more prevalent in Oklahoma in 1930–32 than for several years include *Stomoxys calcitrans*, L., *Cochliomyia macellaria*, F., *Lyperosia* (*Haematobia*) *irritans*, L., *Hypoderma lineatum*, Vill., and *Gastrophilus* spp. Ticks were particularly abundant in the eastern part of the State, especially *Amblyomma americanum*, L., on cattle, and *Dermacentor nigrolineatus*, Pack., on horses. Another widely distributed species was the rabbit tick, *Haemaphysalis leporis-palustris*, Pack., which is a vector of tularaemia [*R.A.E.*, B, xvii, 126].

Sanborn (C. E.), Stiles (G. W.) & Moe (L. H.). **Anaplasmosis Investigations.**—*Rep. Oklahoma Agric. Expt. Sta. 1930–32*, pp. 248–250, 2 refs. Stillwater, Okla. [1933.]

Experiments in transmitting anaplasmosis to cows by various Tabanids [*R.A.E.*, B, xx, 205] have been continued, the additional species now used being *Tabanus aequalis*, Hine. Positive results were obtained in all cases. It was found that only about 50 per cent. of adult cattle survive the acute stage of the disease ; young animals up to 18 months old when inoculated can become carriers, apparently for life, without manifesting the acute stage of the infection.

Both *Musca domestica*, L., and *Stomoxys calcitrans*, L., were exceedingly abundant during the years 1930–32. The most effective spray used, which killed the flies on cattle without injuring the hair or skin of the animals, but did not act as a repellent, was made by extracting pyrethrin from pyrethrum flower buds with kerosene, the proportion taken being one pound of flower buds to a U.S. gallon of kerosene. The preparation and use of this spray are described.

Lins de Almeida (J.). **Nouveaux agents de transmission de la Berne** (*Dermatobia hominis* **L. junior, 1781**) **au Brésil.**—*C. R. Soc. Biol.*, cxiii, no. 27, pp. 1274–1275, 2 refs. Paris, 1933.

A total of 38 eggs of the Oestrid, *Dermatobia hominis*, Say, were found attached to the abdomen of an individual of *Cochliomyia macellaria*, F., collected in January 1932 in the State of Rio de Janeiro. The author points out that the insect recorded as a carrier of eggs of *D. hominis* in a paper by Pinto [*R.A.E.*, B, xix, 1] and by Pinto and da Fonseca [xix, 90] as *Sarcophaga terminalis*, Wied., has now been identified as *Musca* (*Sarcopromusca*) *arcuata*, Towns. An amended list of the egg-carrying species of Muscids is given.

Dudley (S. F.). **Yellow Fever, as seen by the Medical Officers of the Royal Navy in the Nineteenth Century.**—*J. R. N. Med. Serv.*, xix, no. 3, pp. 151–165, 7 refs. London, July 1933.

The following is taken from the author's conclusions : This investigation of old naval reports on yellow fever produces evidence to show that the incubation period may sometimes exceed a week ; that case fatality in groups may vary from zero to 60 per cent. ; that West African strains of the virus are as a rule more fatal to Europeans than American strains ; and that transmission of the virus by means other than *Aëdes aegypti*, L., is too rare to have any practical bearing on the epidemiology of yellow fever. The naval record is consistent with the hypothesis that yellow fever originated in the interior of Africa.

Strickland (C.) & Chowdhury (K. L.). **The Sporozoite Rate of Anophelines caught wild in the Terai, 1931, with a Note on some Correlations in the Infectivity of** *A. funestus*, **by** H. P. Chaudhuri.—*Ind. J. Med. Res.*, xxi, no. 1, pp. 67–89, 1 map, 5 refs. Calcutta, July 1933.

A malaria survey was carried out in tea gardens in the Darjeeling Terai, where malaria is highly endemic, from 20th April to 26th September 1931, with a view to determining whether the Sergents' method of detecting infected mosquitos [*cf. R.A.E.*, B, xix, 206] could be

utilised in a routine public health survey. A total of 22,049 females belonging to fifteen species were examined, but sporozoites were only found in *A. vagus*, Dön. (2 out of 10,452), *A. philippinensis*, Ludl. (1 out of 29) and in the group comprising *Anopheles minimus*, Theo., and *A. fluviatilis*, James (*listoni*, List.), both of which are included under the name *A. funestus*, Giles (308 out of 7,912). The highest number of infective individuals of this group was found during the period 17th July–15th August, which was also the time when the infected individuals of the other two species were taken, and corresponds roughly to the establishment of the rains. The *fluviatilis-minimus* group were collected in tea-garden coolie lines (4,557) and cattle-sheds (4), in village huts (3,136) and cattle-sheds (198), in clerks' houses (16) and bungalows (2) ; but infected individuals were only found in the tea-garden coolie lines (4·7 per cent.), village huts (3·0) and village cattle-sheds (2·5). A comparison of the ratios of the different species in these places shows a remarkable relative zoophilism in *A. annularis*, Wulp (*fuliginosus*, Giles) and a corresponding preference for man in *A. vagus* and the *fluviatilis-minimus* group ; *A. maculatus*, Theo., and *A. culicifacies*, Giles, occupy an intermediate position. If the cattle-sheds had only a small door and the inside was dark and malodorous, many mosquitos, chiefly *A. culicifacies* and *A. annularis* were found, whereas if they consisted of a roof on supports, mosquitos were few or absent, although they were numerous in adjoining huts. When mosquitos were found in huts, there were usually animals in the vicinity. In general, the coolie huts were clean, and although there were inside fireplaces for cooking, they appeared to be less smoky than at Naomundi [xix, 45] and harboured, as a rule, large numbers of mosquitos. When there was no smoke in a hut, mosquitos were still more numerous, but when it was very smoky, they were rarely found. *A. vagus* was usually found in huts in which no fires had been lit for some time ; it may be more sensitive to smoke than the *fluviatilis-minimus* group. This group on the other hand was taken more often in huts where fires were burning brightly, and appeared to be attracted by warmth. Anophelines were relatively very scarce in the European and clerks' habitations, which were generally well-lighted, whereas they were abundant in the coolie huts, which were dark.

From an analysis of the data obtained in this survey, it is concluded that there was a significant relation between the malaria infection rate in the *fluviatilis-minimus* group and minimum temperature, humidity and rainfall, the correlation of increased or decreased infection with the rise or fall of minimum temperature being the most significant. The relation with maximum temperature was not significant.

IYENGAR (M. O. T.). **Oviposition in Mosquitoes of the Sub-genus** *Mansonioides*.—*Ind. J. Med. Res.*, xxi, no. 1, pp. 101–102, 2 pls. Calcutta, July 1933.

The process of oviposition by mosquitos of the subgenus *Mansonioides* as observed in *Mansonia annulifera*, Theo., *M. uniformis*, Theo., and *M. indiana*, Edw., in India is described. The egg-masses were deposited on the leaves of water plants, 1–2 mm. below the water surface. Although when gravid females were enclosed in jars with *Lemna polyrhiza*, egg-masses were laid on the lower surface of the large fronds of this plant, in nature they were found only on the leaves of *Pistia stratiotes*.

Napier (L. E.), Smith (R. O. A.), Das Gupta (C. R.) & Mukerji (S.). **The Infection of *Phlebotomus argentipes* from dermal Leishmanial Lesions.**—*Ind. J. Med. Res.*, xxi, no. 1, pp. 173–177, 5 refs. Calcutta, July 1933.

In the experiments recorded, a flagellate infection rate of 30 per cent. was demonstrated in a group of sandflies (*Phlebotomus argentipes*, Ann. & Brun.) fed on the limbs of persons exhibiting the depigmented lesions of post-kala-azar dermal leishmaniasis [*cf. R.A.E.*, B, xix, 236]. This high percentage was only obtained by allowing the sandflies to feed two or three times on normal mice after their infecting feed and thereby keeping them alive for some days ; of 38 not given a subsequent feed, only one was found to be infected. One was infected from a lesion so rudimentary that it was almost unnoticeable, and it is suggested that infection from a person who has suffered from visceral leishmaniasis can be acquired by sandflies in the interval (at least a year) before the dermal lesions become visible.

Sinton (J. A.). **Notes on some Indian Species of the Genus *Phlebotomus*. Part XXXIV.** *Phlebotomus iyengari* **n. sp.**—*Ind. J. Med. Res.*, xxi, no. 1, pp. 221–224, 1 pl., 3 refs. **Part XXXV. Additions and Alterations to the Diagnostic Table of Females.**—*T.c.*, pp. 225–228, 1 pl., 8 refs. Calcutta, July 1933.

In the second paper the key to the females of Indian species of the genus *Phlebotomus* [*cf. R.A.E.*, B, xx, 233] is emended to include the the new species dealt with in the first paper and four others recently described [*cf.* xix, 234 ; xxi, 16, 96].

Recent work with a chloral-lacto-phenol clearing agent for fresh or dry specimens of *Phlebotomus*, which was described by Langeron and consists of 2 parts chloral hydrate crystals, 1 part carbolic acid crystals and 1 part pure lactic acid, has shown it to be even more satisfactory than lacto-phenol. This fluid has also been found satisfactory for examining the appendages of mosquitos and other insects.

Manson (D.) & Ramsay (G. C.). **Further Observations on a Malaria Survey in the Jorhat District, Assam, with some Notes on the Antimalaria Measures employed.**—*Rec. Malar. Surv. India*, iii, no. 3, pp. 479–494, 2 fldg. graphs, 3 refs. Calcutta, June 1933.

This paper records the results of work on Anophelines and malaria carried out in tea gardens in the Jorhat District of Assam from 1st August 1931 to 31st July 1932, previous results having already been recorded [*R.A.E.*, B, xix, 226 ; xx, 197]. Eighteen species of Anophelines have now been found, all of which have been noticed in a previous list [xviii, 30], except *Anopheles umbrosus*, Theo., which appears to be widely distributed over the whole area surveyed. Its larvae were found in stagnant water ditches and pools, exposed to sunlight or in light shade, and also in denser shade than any other species in Assam ; so far they have not been taken in places shaded by thickly matted vegetation. In view of the fact that this species is a malaria vector in Malaya [xviii, 151], detailed investigations were made on its bionomics ; the results indicate, however, that it does not normally feed on man in Assam. Very brief notes are given on the seasonal distribution and breeding-places of some of the other species and on the parasites of the larvae and adults encountered during the

investigations. The infectivity survey was continued throughout the year ; malaria parasites were again found only in *A. minimus*, Theo. [*cf.* xx, 197], with the exception of a gut infection in *A. kochi*, Dön., in September ; this species does not appear to be of any importance, however, as it feeds mainly in cow-sheds. The finding of a gut infection in *A. minimus* early in April indicates that anti-larval measures should not be commenced later than the middle of March ; owing to the high degree of infection during November, they are carried on until the night temperature in that month falls below 60°F. The relative advantages of using oil or Paris green and planting various types of vegetation to prevent breeding by producing dense shade over drains and natural watercourses are discussed. Bamboo matting about 6 ft. wide anchored to the banks of reservoirs effectually prevents the breeding of *A. minimus*. Thorough cleaning of the banks is also effective as a rule, but should be repeated every 10 days to ensure success. Reservoirs can be oiled with safety provided that the water is withdrawn by a pipe with the inlet at least 18 inches below the surface. Bamboo matting can also be used to cover narrow, stagnant drains. Between the middle of November 1931 and 15th March 1932, the night temperatures fell below 60°F., and no anti-larval measures were carried out. During this period the summer breeding-places of *A. minimus* are dry, and although breeding continues in the permanent water-courses, the larvae are wintering and remain in the same stage for not less than two months and probably in many instances for considerably longer. Adults usually hibernate during this period, and it is only in warm cow-sheds or in heated dwellings that they can be induced to feed. Owing to the long distances covered by adult mosquitos when migrating to their winter resorts or returning to their summer breeding-places, it is concluded that the treatment of winter breeding-places within a limited radius is of no practical value in reducing the density of the adult mosquito population during the ensuing transmission season [*cf.* xviii, 171].

SINTON (J. A.). **Rice Cultivation in Spain, with Special Reference to the Conditions in the Delta of the River Ebro.**—*Rec. Malar. Surv. India*, iii, no. 3, pp. 495–506, 3 refs. Calcutta, June 1933.

During the summer of 1931 the author visited some of the rice-growing areas of Spain, and here gives his impressions of the malaria problems associated with them. The first phase of rice cultivation, when uncultivated swampy localities are being converted by means of filling, drainage, irrigation, etc., into areas suitable for rice-growing, appears invariably to be accompanied by a severe outbreak of malaria. This seems to be due largely to conditions associated with the aggregation of immigrant labour (particularly to the importation of a non-immune population into an area where malaria is endemic, or of an infected population into an area where there is a susceptible local population), to the disturbance of the established balance of the original fauna and flora of the region, and to the effect of changes in the number and distribution of the human and animal population on the distribution of Anophelines. In the second phase, when the actual cultivation of rice has begun, conditions are very similar to those in the first phase. The scarcity of the population necessitates the importation of labour at certain periods of the year ; the conditions under which the population lives are usually primitive ; and the expenses incurred at

this period are probably heavy, and the consequent undernourishment and overcrowding are conducive to the continuance of a high incidence of malaria. In the old, well established areas of rice cultivation, the malaria problem is said to be negligible ; the population has increased and become prosperous and the adverse conditions mentioned above have largely disappeared. Domestic animals are plentiful and are housed under conditions that attract mosquitos.

It is towards this third phase that conditions at La Cava in the Ebro Delta most nearly approach. Malaria was prevalent until a few years ago, but, probably as a result of a treatment campaign, it has diminished considerably. Anophelines are abundant and, if a gametocyte carrier is introduced, the disease is usually transmitted to the entire household but does not appear to spread to neighbouring houses several hundred yards away. The reasons for this localisation appear to be that there are numerous suitable Anopheline breeding-places in the rice-fields in the immediate vicinity of dwellings, a plentiful food-supply in the domestic animals and suitable shelter in the dark, warm animal sheds.

It seems probable that a fourth phase may occur in which Anophelines are numerous but malaria is absent. The author visited such an area in Italy, and in this connection suggests that the explanation of this phenomenon may be due, not to the evolution of a zoophilous from an anthropophilous race in the same species, but to the replacement of one distinct species by another owing to changes of environment. Whether this phase exists in any of the rice-growing areas in Spain is not known, but conditions reported in one locality suggest that it may. The anti-malaria measures to be undertaken would appear to be the mass treatment of the population and the elimination of gametocyte carriers. Where possible, steps should be taken to bring about as rapidly as possible the conditions obtaining in the third stage of rice cultivation.

SUR (S. N.), BHATTACHARJI (K. P.) & KHAN (B. M.). **Report on a Malaria Survey in Kalimpong and Sikkim.** [Abstract.]—*Rec. Malar. Surv. India*, iii, no. 3, pp. 571–575. Calcutta, June 1933.

A brief account is given of investigations on malaria carried out in the Kalimpong Subdivision of the Darjeeling District, Bengal, and in Lower Sikkim between 1st July and 8th August 1932. In the first region, the town of Kalimpong and 16 villages varying in elevation from 625 to 4,700 ft. were surveyed, and it was found that the malaria incidence varied with the altitude, the spleen rates being negligible above 4,000 ft. Eight species of Anophelines were obtained, of which *Anopheles maculatus*, Theo., with its var. *willmori*, James, was the most numerous.

In the second region, Gantok, the capital, and 4 neighbouring villages, and 13 villages in the vicinity of the Tista River were surveyed, the altitudes varying from 1,200 to 5,700 ft. The nature of the country, the population and the agricultural conditions are similar to those in the Kalimpong area, and the incidence of malaria appears again to vary inversely with the altitude. Ten species of Anophelines were taken, but *A. maculatus*, with its var. *willmori*, was the most abundant, and it is thought that this species is probably the most important vector in the two areas, both on account of its prevalence and of its reputation as a vector in Malaya. The principal breeding-places were slowly running streams, springs, seepages and terraced

rice-fields. The apparent absence of this species from dwellings, cow-sheds, etc., was found by experiment to be due to the fact that it enters houses after sundown and feeds freely on man and animals, but leaves again before daybreak. It shelters during the day in the shade of hillside vegetation, in caves, under bridges, etc. As anti-larval measures appear to be impracticable for financial reasons, the treatment of the population of malarious tracts with quinine and plasmochin is recommended.

Basu (B. C.). **Report on a brief Survey of Malaria and Anophelines in Patna.** [Abstract.]—*Rec. Malar. Surv. India*, iii, no. 3, pp. 577–578. Calcutta, June 1933.

A brief investigation of the prevalence of malaria and Anophelines in Patna was undertaken during 8 days in October 1930. The town is situated on relatively high ground, but owing to the natural slope, storm and surface water drains away from and not towards the river, forming swamps and marshes that are ideal breeding-grounds for Anophelines, which also breed in the drains and borrow-pits situated on the same side of the town. As the piped water supply is intermittent, concrete storage tanks are common. The six species of *Anopheles* collected included *A. culicifacies*, Giles, and *A. annularis*, Wulp (*fuliginosus*, Giles), which are probably the vectors of malaria ; in spite of the presence of apparently suitable breeding-places, *A. stephensi*, List., was not found. It is suggested that malaria might occur in Patna in epidemic form, and a more detailed investigation is recommended.

Jaswant Singh (S. A. S.). **Some Observations on the Mosquitoes and Sandflies of Rajputana.** [Abstract.]—*Rec. Malar. Surv. India*, iii, no. 3, pp. 579–581. Calcutta, June 1933.

In the course of this report on two short tours made in Rajputana during 1932, lists are given of the mosquitos and sandflies (*Phlebotomus*) collected in different localities. The Anophelines found were *Anopheles annularis*, Wulp, *A. culicifacies*, Giles, *A. fluviatilis*, James, *A. moghulensis*, Christ., *A. subpictus*, Grassi, *A. splendidus*, Koidz., *A. jamesi*, Theo., *A. stephensi*, List., *A. theobaldi*, Giles, and *A. pulcherrimus*, Theo.

Wallace (R. B.). **Paris Green as a Larvicide on an inland hilly Estate in Malaya.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxvii, no. 2, pp. 131–146, 1 pl., 4 charts, 5 refs. London, 28th July 1933.

A test of the value of Paris green as a mosquito larvicide was carried out in 1930, particularly against *Anopheles maculatus*, Theo., on an inland hilly estate in Malaya. Most of the water treated was moving more or less rapidly [*cf. R.A.E.*, B, xix, 5]. Paris green was used at the rate of 1 part to 99 parts of diluent (lime, talc or soapstone powder) and was distributed by mechanical blowers and sprayers, applications being made every 6 days as compared with every 7 days with applications of oil in other years. The results were checked 24 hours afterwards, except during one month, when 48 hours were allowed to elapse. Many more breeding-places were found, chiefly in running water, than during the corresponding months of previous years when oil was used. Analysis of the larvae found 24 hours after application showed that many were several days old, indicating that Paris

green is not as effective as oil within this interval; there was also no evidence that more larvae were killed after 48 hours. In spite of treatment of epidemics with plasmochin and quinine, the malaria rate was consistently higher than in the previous year, and the reduction in cost of the anti-larval treatments as compared with that of oil was counterbalanced by the high cost of the treatments required for epidemics.

Whereas Paris green is cheap, easily transported and more easily handled than oil, it is difficult to prove its application and more supervision of native labour is therefore involved in its use. It does not affect the eggs, pupae or very young larvae of Anophelines and is innocuous to Culicines, so that the risk of diseases carried by the latter is greater than when oil is used.

RUSSELL (P. F.). **The Value of an Animal Barrier in Malaria Control.**—*Science*, lxxviii, no. 2014, pp. 101–102, 2 refs. New York, 4th August 1933.

One of the chief reasons for doubting the effectiveness of an "animal barrier" for preventing the infection of man with malaria is the belief that different Anopheline mosquitos have definite preferences for feeding on man or on animals. During January-April 1933, collections of Anophelines of the *funestus-minimus* sub-group were made in an area in the Philippines, having a population of about 800. Of 705 mosquitos dissected, of which 5 contained malaria parasites, 133 were taken along the banks of streams by day and 572 on water buffalo at night. Oöcysts were found in one example of *Anopheles filipinae*, Mnlg., and sporozoites, with or without oöcysts, in four of *A. minimus* var. *flavirostris*, Ludl. One of these last was caught along a stream-bank, the other four infected insects being taken on water buffalo. This affords strong evidence that mosquitos that had fed on an infected man were attracted to water buffalo for a subsequent feed at a time when they were infective. As, however, malaria is prevalent in this area, it is evident that the mere presence of domestic animals attractive to Anophelines does not prevent infection, and that, if an animal barrier is to be of use, it must be arranged on systematic lines.

LEE (C. U.). **A Survey of the Mosquitoes and their Breeding Habits in the Amoy Region.**—*1st Ann. Rep. Mar. Biol. Ass. China 1932*, pp. 75–77. Peiping, 1933.

A list is given of the mosquitos collected on the Islands of Amoy [*cf. R.A.E.*, B, xxi, 157] and Kulangsu and in two villages on the coast of the mainland, with very brief notes on their breeding-places. The Anophelines were *Anopheles hyrcanus* var. *sinensis*, Wied., *A. minimus*, Theo., *A. maculatus*, Theo., *A. splendidus*, Koidz., and *A. jeyporiensis* var. *candidiensis*, Koidz.

SERGENT (A.), MANCEAUX (A.) & BALLISTE (R.). **Premier cas de fièvre récurrente hispano-africaine observé en Algérie.**—*Bull. Soc. Path. exot.*, xxvi, no. 7, pp. 906–908. Paris, 1933.

A case of relapsing fever due to a spirochaete of the group of *Spirochaeta hispanica* is recorded for the first time from Algeria. Ticks (*Ornithodorus*) were numerous in the burrows of sewer rats in the neighbourhood of the dwelling in which it occurred.

Roubaud (E.) & Colas-Belcour (J.). **Notes sur un culicide méditerranéen,** *Theobaldia longeareolata* **Macq.**—*Bull. Soc. Path. exot.*, xxvi, no. 7, pp. 934–937, 9 refs. Paris, 1933.

An account is given of observations on the habits of *Theobaldia longiareolata*, Macq. This species appears to be homodynamic ; all stages were collected in December at Toulon, and further generations were produced in an insectary in Paris without a diapause at a temperature of about 25°C. [77°F.]. The adults were maintained on poultry, and the larvae were found to thrive in water soiled with bird droppings. Although opportunities were given for feeding on rabbits or man, females dissected contained only avian blood. Males are, however, attracted by the odour of man for a few moments, and this might be wrongly construed as a tendency to attack man. The fact that this species is chiefly confined to the Mediterranean region and is not more widely distributed in the north may be due to its need for temperatures that will permit of continuous reproduction.

Colas-Belcour (J.). **Contribution à l'étude de la biologie de l'***Argas vespertilionis* **Latr.**—*Bull. Soc. Path. exot.*, xxvi, no. 7, pp. 937–940, 9 refs. Paris, 1933.

An account is given of observations on the bionomics of *Argas vespertilionis*, Latr., which has been found for several consecutive years in the same locality in Normandy, parasitising bats (*Pipistrellus pipistrellus*). The difficulty with which this tick was induced to feed on mice suggests that mammals other than bats are probably abnormal hosts that are only attacked after a prolonged fast.

Roubaud (E.) & Colas-Belcour (J.). **Observations sur la biologie de l'***Anopheles plumbeus*. **II.—L'asthénobiose cyclique hivernale.**—*Bull. Soc. Path. exot.*, xxvi, no. 7, pp. 965–972, 13 refs. Paris, 1933.

An account is given of further experiments on the biology of *Anopheles plumbeus*, Steph. [*cf. R.A.E.*, B, xx, 213]. During the winter of 1932–33, it was found that larvae of this species could normally withstand temperatures of −6 to −8°C. [21·2–17·6°F.] for 5 days in receptacles exposed to outdoor temperatures. In two of these receptacles the suspension of mashed oak bark was a solid block of ice for at least two days. For the greater part of the time the larvae remained immobile in contact with a thick block of ice, but they regained their vitality without appreciable mortality when the ice thawed. They are able to withstand submersion under a layer of oil for about 60 days during hibernation and for 49 days during the summer [*cf.* xx, 190].

The larvae undergo a period of asthenobiosis or true hibernation [*cf.* xiv, 123], any hibernating adults found during the winter being either casual survivors of the summer generations or abnormally early individuals of the overwintering generation. The life-cycle to the adult stage occupied 22–29 days from eggs laid in May–June, and 135–271 days from those laid in September, under the same conditions of temperature and larval nourishment. In 1933 the corresponding generations occupied 23–25 days and 161–226 days. The longest larval period observed during these experiments was about 325 days.

Larvae from eggs laid in September–October were divided into three lots, the first being kept out of doors where the average temperature was lower than 16°C. [60·8°F.] with intermittent frost, the second at laboratory temperature (20–22°C. [68–71·6°F.]) and the third in an incubator at 25–28°C. [77–82·4°F.]. The conditions of nourishment were the same. The 85 larvae of the first lot completed development in 169–223 days with no mortality, the second lot took 161–230 days and the third lot did not develop beyond the 2nd or 3rd instar, all dying (within a period varying from several weeks to 6–7 months) without pupating. Thus the hibernating larvae do not react to heat by exhibiting a shortened period of development.

Other experiments showed that the period of development of hibernating larvae was the same whether in diffused or bright light and whether the larvae were fed on their natural medium from tree holes or given additional nourishment. These observations confirm the theory that true hibernation is a phenomenon independent of external influences and is due to internal causes. Larvae of *A. plumbeus* are not affected by asthenia during any particular instar ; even in larvae from the same batch of eggs, differences may be observed, some rapidly reaching the 3rd or 4th instar and then remaining in a state of diapause for months and others growing very slowly from the beginning and reaching maturity even later. The continuous rearing of *A. plumbeus* was rendered possible by the discovery that it is a eurygamic species [*cf.* xx, 213], pairing being obtained only in large cages. In these experiments the asthenic hibernating generation was always succeeded by an active generation that completed its development in a short period, and it would appear that in nature the strain used (which originated in Normandy) has not more than two or three generations annually. Whether these observations are valid for all individuals of this species, or whether there are also homodynamic races not subject to cyclic fatigue, is not yet known.

MARSHALL (J. F.). **An Inland Record of *Aëdes detritus*, Haliday (Diptera, Culicidae).**—*Nature*, cxxxii, no. 3325, p. 135. London, 22nd July 1933.

Aëdes detritus, Hal., which usually breeds in collections of salty water in low-lying seaside districts, is recorded in association with *A. caspius*, Pall., from ditches on a sewage works at Droitwich. Owing to the brine springs in this district and the consequent infiltration of brackish water into the sewers, the water in the ditches is more or less saline. How *A. detritus* was introduced into this area is not known, but it is of interest to note that its eggs are able to withstand long periods of desiccation, and that up to comparatively recent times salt-carrying barges plied continuously between Droitwich and the Bristol Channel. This species has been found inland in Germany on two occasions, in districts where extensive salt deposits exist.

[MARSHALL (J. F.).] **Mosquitoes and their Larvae. How to recognise and collect them.**—*Circ. Brit. Mosq. Contr. Inst.*, no. 22, 12 pp., 15 figs. Hayling Island, Hants. [1933.] Price 6*d*.

This small pamphlet gives a brief general account of the bionomics of mosquitos, with particular reference to British species, and describes how adults and larvae may be collected and forwarded for identification.

DE BUEN (S.) & DE BUEN (E.). **El** *Anopheles maculipennis* **y la casa. Sus relaciones con la epidemiologia del paludismo en España.** [*A. maculipennis* and Houses. Its relation to the Epidemiology of Malaria in Spain.]—*Med. Países cálidos*, vi, no. 4, pp. 270–299, 30 refs. Madrid, July 1933.

This paper summarises data obtained over many years in Spain by the authors and others on the local and seasonal distribution of *Anopheles maculipennis*, Mg. [*cf. R.A.E.*, B, xxi, 125]; its migration to and from, and behaviour in, houses and animal quarters; the numbers of females infected with malaria and the nature of the blood-meals; and the abundance of the mosquito in houses, considered in relation to the distribution of malaria cases, the annual cycle and intensity of the disease, and the problem of biological races. These data are then examined in relation to the various theories that assign importance as a factor in the incidence of malaria to the habits of *A. maculipennis* in relation to houses [*cf.* xviii, 227; xx, 56; etc.]. The authors conclude that in the districts of Spain where they worked, the greater frequency of malaria in houses probably depends more on the habits of man than on any acquired habit leading all or some of the mosquitos of a given locality to associate exclusively with human dwellings. This exclusive association, involving the return of infected mosquitos after an incubation period to the house in which the infection was acquired, apparently occurs only in quite special circumstances, *e.g.*, where isolated dwellings are situated near breeding-places.

WEYER (F.). **Untersuchungen zur Rassenfrage bei** *Anopheles maculipennis* **in Nordwestdeutschland.** [Investigations on the Question of Races of *A. maculipennis* in north-western Germany.]—*Zbl. Bakt.* (I. Orig.), cxxvii, no. 7–8, pp. 397–417, 2 figs., 22 refs. Jena, 23rd February 1933.

This paper opens with a brief summary of theories on the existence of two different races of *Anopheles maculipennis*, Mg., only one of which transmits malaria. Different workers have attempted to distinguish these races on the basis of the maxillary index [*R.A.E.*, B, xvi, 210; xix, 162; etc.], wing-length and colour [xv, 180; xviii, 211, 228; etc.], and the markings and size of the eggs [xv, 71; xx, 57, 211; etc.]; the author considers the characters of the eggs to be the most reliable.

A detailed account is given of investigations carried out in 1931 and the first half of 1932 in the Emden district in eastern Friesland [*cf.* xxi, 115] with a view to determining whether data on racial differentiation obtained in Holland hold good for northern Germany. This area is the only one in Germany in which malaria is endemic; it consists of marshland with meadows crossed by numerous canals and ditches that offer favourable breeding conditions for mosquitos and is devoted to the raising of cattle and horses. The mosquitos occur almost exclusively in animal quarters, especially in pigsties, and but seldom in human dwellings, even in close proximity. They hibernate in sheds in which cattle or pigs are kept and begin to oviposit in April. There are two generations a year, the young adults of the first generation occurring from the beginning of June and those of the second being abundant in the second half of August. Occasional oviposition continues until the mosquitos enter hibernation in September.

Examinations of eggs showed that almost the only form present in the Emden district was that having eggs of the dark dappled-grey

type (var. *labranchiae*, Falleroni) [but *cf.* xxi, 211], whereas the eggs collected in the non-malarious district of Friedrichsmoor near Schwerin were dark barred (var. *messeae*, Falleroni). During a visit to Holland in September 1931, the author found that these two races correspond to the Dutch short-winged and long-winged mosquitos respectively [*cf.* xxi, 137]. Details are given of the lengths of the thorax and wings and of the maxillary index of mosquitos taken in and outside eastern Friesland. The constant average differences in size observed between the races in Holland did not hold good for north-western Germany, as the size of the mosquitos of both races varied greatly with the time of year, even in insects taken in the same locality, and mosquitos of the race with dappled eggs were sometimes larger than those with barred ones. The author believes that size is influenced by environmental factors, such as larval nutrition and temperature [*cf.* xix, 143, etc.]. The maxillary index in the mosquitos of the malarious Emden area was invariably 17–18, whereas in those of the Friedrichsmoor district it was somewhat lower than 17, which agrees with characters found in Holland, but contrary to observations in that country, no correlation was found between the colour of the mosquitos and size or maxillary index.

The results of investigations on the salinity and hydrogen-ion concentration of the waters in which the mosquitos bred were inconclusive. Those laying dappled eggs bred chiefly, but not exclusively, in brackish water. Though endemic malaria in eastern Friesland is confined to the area in which *labranchiae* occurs, it is not distributed throughout this area. It was, however, always absent from districts in which a pure race of mosquitos with barred eggs (var. *messeae*) occurred. These mosquitos only bred in fresh water.

FUSS (S.) & HANSER (R.). **Ueber Trombidiosis.**—*Arch. Derm. Syph.*, clxvii, no. 3, pp. 644–658, 3 figs., 7 refs. Berlin, 2nd March 1933.

The literature on *Trombicula autumnalis*, Shaw, which attacks man and causes a painful irritation of the skin, is briefly reviewed, and notes are given on its bionomics [*R.A.E.*, B, xviii, 13, 125–127 ; xix, 2], partly based on personal observations in the Rhine Palatinate. The mites occur in low-lying as well as mountainous regions up to an altitude of 6,500 ft. [*cf.* xii, 51]. After having fed on a warm-blooded host for 3–5 days, the larvae go into the soil where they enter what the authors call a pupal stage and transform within 14 days into nymphs. These continue to live in the soil for 3–4 weeks, when " pupation " again takes place, the adult stage being reached after 14 days. The adults remain in the soil and hibernate [*cf.* xviii, 127]. In the Rhine Palatinate, the larvae are present from the second half of July till about mid-September, only isolated individuals being found in October. The reason why infestations are confined to restricted foci has not been ascertained ; in the authors' experience, one garden was severely infested for three consecutive years, whereas two adjoining gardens were free from the larvae. Contrary to a previous view [xviii, 127], they conclude that the mites may crawl up trees, since one of them suffered from an infestation confined to the neck when working under a pear tree. Also, their own observations and experience did not confirm the suggestion that immunity from attack can be acquired [xx, 228]. The type of dermatitis caused by *T. autumnalis* is described in detail

from the literature and personal observations, and its diagnosis and treatment are discussed. The application of soap to the infested skin is recommended to soothe the irritation.

O'CONNOR (B. A.). **Entomological Notes.**—*J. Dept. Agric. W. Aust.*, (2) x, no. 2, pp. 228–229. Perth, W.A., June 1933.

Trichodectes subrostratus, Nitz. (cat louse) was taken on a cat in April 1933 for the first time in Western Australia. The unidentified species of *Calliphora* previously recorded [*R.A.E.*, B, xix, 113] has been determined as *C. nociva*, Hardy [xxi, 56].

MCCALLUM (H.) & JOHNSON (W. McC.). **Blow-fly Dressings and Branding Fluids. The detrimental Effect of Tar-containing Preparations on the Wool.**—*J. Dept. Agric. W. Aust.*, (2) x, no. 2, pp. 262–264. Perth, W.A., June 1933.

In view of the reported staining of sheep's wool by a preparation containing creosote, the use of blow-fly dressings containing tar or pitch is considered inadvisable, others that cause no harm to the wool or to the natural properties of the fibre being recommended [*R.A.E.*, B, xix, 154].

MOLINA CRUZ (J.). **Las Larvas de Mosca en Cirugía.** [Fly Larvae in Surgery.]—Thesis, 94 pp., 26 figs. Mexico, D.F., Univ. nac., Fac. Med., 1933.

Descriptions are given of the technique involved in the use of larvae of *Lucilia sericata*, Mg., for the treatment of osteomyelitis [*cf. R.A.E.*, B, xx, 125–129; xxi, 174; etc.], including methods of breeding the flies and obtaining sterile larvae, and of applying them to the wounds. Their action is discussed. Notes on the bionomics of *L. sericata* and the anatomy of the adults and larvae are included.

BEDFORD (H. W.). **Report of the Government Entomologist for the Year 1932.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 36, 35+3 pp. multigraph, 1 map. Khartoum, January 1933. [Recd. August 1933.]

Two pages of this report (29–31) are devoted to work on medical entomology in the Sudan. An account is given of experiments in breeding larvae of *Wohlfahrtia nuba*, Wied., for the treatment of osteomyelitis [*R.A.E.*, B, xxi, 205]. Larvae of *Chrysomyia albiceps*, Wied., and *C. marginalis*, Wied., both of which are egg-laying species and are readily attracted to putrefying animal matter, were also reared for this purpose, but the former were too active and did not stay in the wound, and the latter were not used as they are too spiny and would probably cause considerable irritation.

Almost all Anopheline larvae taken from river pools at various places on the Blue Nile and Main Nile in February-March and again in May-July were *Anopheles gambiae*, Giles; during September and October this species occurred in rainwater pools in and around Khartoum. The only other Anophelines obtained were 2 examples each of *A. pharoensis*, Theo., and *A. rufipes*, Gough, from the Sunt Forest on the White Nile.

Blanc (G.), Noury (M.), Baltazard (M.) & Fischer (—). **Présence chez le pou de l'écureuil de Gétulie, d'un virus récurrent, type hispano-africain, pathogène pour l'homme et le cobaye.**—*C. R. Acad. Sci. Fr.*, cxcvii, no. 7, pp. 496–497, 3 refs. Paris, 1933.

Continuing previous experiments [*R.A.E.*, B, xxi, 190], the authors removed 50 individuals of *Linognathoides* (*Neohaematopinus*) *pectinifer*, Neum., from a palm rat (*Atlantoxerus getulus*) from Morocco and inoculated them into a guineapig by intraperitoneal injection. After two attacks of fever, spirochaetes were found in the blood of the latter on the 9th and 10th day. Subinoculation into a man and guineapigs produced a relapsing fever entirely comparable to the Hispano-African form of the disease. The spirochaetes were apparently identical with those that cause this disease [the *Spirochaeta hispanica* group], and it would be of great interest to prove this identity by infecting *Ornithodorus erraticus*, Lucas, and so to demonstrate the existence of a relapsing fever naturally transmissible by both ticks and lice.

Jussiant (—). **Contribution à la prophylaxie des trypanosomiases animales et humaines.**—*Bull. méd. Katanga*, x, no. 1, pp. 8, 11–12, 14–15. Elisabethville, 1933.

A brief account is given of the successful use of large numbers of Harris traps [*R.A.E.*, B, xix, 78] in the control of *Glossina palpalis*, R.-D., in the Lomami-Kasai region of the Belgian Congo, where cattle rearing has been established. Their use is at present confined to preventing the spread of the fly and protecting places where cattle are watered, etc. In an instance cited, two traps caught 846 flies in 24 days. Attempts to determine the optimum conditions for the operation of the trap suggest that it should be 13–16 ins. from the ground with an opening between 3½ and 5½ ins. wide, and that it should be placed in full sunlight, on cleared ground, about 4 yds. from the edge of the forest.

Van Hoof (L.) & Henrard (C.). **La transmission cyclique de races résistantes de** *Trypanosoma gambiense* **par** *Glossina palpalis*.—*Ann. Soc. belge Méd. trop.*, xiii, no. 2, pp. 219–244, 5 refs. Brussels, 30th June 1933.

An account is given of a series of experiments carried out at Leopoldville on the transmissibility of strains of *Trypanosoma gambiense* isolated from man in the Belgian Congo, using *Glossina palpalis*, R.-D., reared in the laboratory or caught in nature [*cf. R.A.E.*, B, xvii, 37].

The following is taken largely from the authors' summary and conclusions: The nine strains studied showed varying degrees of resistance to specific arsenical drugs. Neither mechanical nor cyclical transmission to guineapigs or monkeys modified the degree of resistance. The acquisition of drug-resistance, whether in nature or in the laboratory, did not appear to bring about any change in the morphology of the trypanosome, which continued to exhibit in guineapigs a polymorphism often varying from day to day. A single mechanical passage from man to guineapig was sufficient to render either resistant or non-resistant strains of the trypanosome cyclically intransmissible by *Glossina*. This intransmissibility was maintained after subinoculation into a monkey. All laboratory animals subjected to the bites of flies shown by subsequent dissection to harbour trypanosomes in

their salivary glands became infected. From 0 to 24·5 per cent. of the flies fed on guineapigs containing an intransmissible strain of the trypanosome showed infection of the mid-intestine, whereas 10–14·3 per cent. of flies fed on transmissible strains in man showed such infection. Thus the frequency of gut infection is of little value in determining transmissibility. It was found advisable to allow at least four infecting feeds. In one experiment an artificial raising of the temperature appeared to stimulate the metacyclic development of the parasites [*cf.* xx, 275], but data on temperature taken throughout these experiments revealed no relation between its seasonal variations in Leopoldville and the facility with which transmission was obtained.

KAUNTZE (W. H.) & SYMES (C. B.). **Anophelines and Malaria at Taveta.**—*Rec. Med. Res. Lab. Kenya*, no. 5, 26 pp., 1 fldg. map, 1 fldg. chart. Nairobi, 1933.

In this district, the malaria parasite rate in children probably never falls below 40 per cent. in the forest, whereas in the mission area it falls to about 20 per cent. during dry periods. In the mission area, larvae of *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. nili*, Theo., were present throughout the year, with appreciable numbers of *A. coustani*, Laveran (*mauritianus*, Grp.) and *A. longipalpis*, Theo., during the dry months (August–October) and small numbers of other species. In the forest area, *A. funestus*, Giles, and *A. coustani* predominated, with appreciable numbers of *A. marshalli*, Theo., and *A. natalensis*, Hill & Haydon. The relatively large numbers of larvae of *A. coustani* in both areas and the absence of adults of this species in dwellings suggest that it is a negligible factor in malaria transmission. The same reasoning applies to *A. nili* in the mission area. *A. gambiae* and *A. funestus* are the important malaria vectors. From experiments in huts containing man and cattle or man alone, it seems certain that there is no tendency for mosquitos to feed on cattle and ignore man in huts where both are present. A high degree of malaria incidence undoubtedly results from the activity of *A. gambiae* in both the forest and mission areas. It also seems clear that *A. funestus* is responsible for the very high parasite rates in the dry period (December), whereas the dry-season abundance of *A. gambiae* in the mission area, though responsible for a large increase of infection, produces a very much lower incidence of parasites. It appears, therefore, that the greater incidence of malaria in the forest is due to *A. funestus*.

MEGAW (Sir J.). **A Note on Professor Nicolle's Views on the Typhus and Relapsing Fevers.**—*Ind. Med. Gaz.*, lxviii, no. 8, pp. 462–464. Calcutta, August 1933.

The author does not approve of Nicolle's suggestion that the epidemic typhus transmitted by lice [*Pediculus*] should be designated "historic typhus" and the endemic type transmitted by fleas "murine typhus" [*cf. R.A.E.*, B, xx, 245], and points out that his own scheme of employing the name of the vector [*cf.* xvi, 233] has obvious practical advantages, but must now be extended to include flea typhus as the name for benign or murine typhus. "Louse relapsing fever" is also suggested for the disease called by Nicolle "world-wide relapsing fever."

PARKER (R. R.) & DAVIS (G. E.). **Further Studies on the Relationship of the Viruses of Rocky Mountain Spotted Fever and São Paulo Exanthematic Typhus.**—*Publ. Hlth. Rep.*, xlviii, no. 29, pp. 839–843, 3 charts, 1 ref. Washington, D.C., 21st July 1933.

In this paper further evidence is adduced to suggest that the exanthematic typhus of São Paulo and Rocky Mountain spotted fever are immunologically identical [*cf.* *R.A.E.*, B, xxi, 189].

COOLEY (R. A.). **The Rocky Mountain Wood Tick.**—*Bull. Montana Agric. Expt. Sta.*, no. 268, 58 pp., 1 col. pl., 14 figs., 37 refs. Bozeman, Mta., November 1932. [Recd. August 1933.]

This bulletin has been prepared largely from the literature in response to a general demand for information regarding the Rocky Mountain wood tick, *Dermacentor venustus*, Banks (*andersoni*, Stiles). The distribution, life-history, seasonal history, habits and host relations of the tick and the part played by it in the transmission of Rocky Mountain spotted fever, tularaemia and tick paralysis in man, and tularaemia and tick paralysis in domestic animals are discussed. Notes are given on the distribution, host relations and disease-carrying ability of *D. albipictus*, Pack., *D. variabilis*, Say, and *Haemaphysalis leporis-palustris*, Pack., and on the seasonal history of the last two ; some other ticks of less importance in Montana are also mentioned. Methods of removing attached ticks and types of clothing that minimise liability to infestation are briefly described. The various methods for controlling the tick, such as dipping, pasture rotation, rodent poisoning, and the use of parasites are discussed.

PARKER (R. R.), PHILIP (C. B.) & JELLISON (W. L.). **Rocky Mountain Spotted Fever. Potentialities of Tick Transmission in Relation to Geographical Occurrence in the United States.**—*Amer. J. Trop. Med.*, xiii, no. 4, pp. 341–379, 1 pl., 10 charts, 31 refs. Baltimore, Md., July 1933.

During the last two years, the problem of Rocky Mountain spotted fever has become of more general interest in the United States owing to its discovery in a considerable number of eastern and central States ; the records suggest that the virus is widespread in nature in the regions concerned. The distribution of *Dermacentor venustus*, Banks (*andersoni*, Stiles) is limited to the Rocky Mountain region, and the transmission of the disease by other species of tick has therefore been studied [*cf.* *R.A.E.*, B, xvii, 126 ; xix, 195 ; xxi, 69]. In experiments in which more than 25,000 individuals of *Haemaphysalis leporis-palustris*, Pack., collected during the past two seasons in Minnesota, were tested in groups of about 100, 90 per cent. of the tests gave results that could only be interpreted as indicating the presence in them of an avirulent strain of the virus, such as has been repeatedly found in this tick in the northern Rocky Mountain region and also in *D. venustus* on the eastern side of the Bitterroot valley. The same type of virus has also been found in Minnesota in *D. variabilis*, Say, collected during 1931 and 1932 [*cf.* xxi, 69].

A detailed account is given of experiments on the transmission of the virus by a number of ticks that might be concerned in its maintenance in nature or in its transmission to man [*cf.* xxi, 209]. The

engorging of the ticks in stages subsequent to that in which the infecting feed was given furnished evidence of transmission by feeding. In *D. variabilis* the virus was transmitted from one stage to the next and also from female to progeny ; in *D. reticulatus occidentalis*, Neum., from larval to adult ticks of the same generation over a period of 96 days and from female to larvae over a period of 64 days ; in *Rhipicephalus sanguineus*, Latr., from larval ticks of one generation through 6 successive stages to adults of the next generation over a total period of 407 days ; in *Amblyomma americanum*, L., from female to larvae over a period of 162 days ; in *A. cayennense*, F., from larvae to adults over a period of 81 days ; and in *D. parumapertus marginatus*, Banks, it was transmitted by adults infected as adults.

With regard to *H. leporis-palustris* [*cf.* xvii, 126], it is suggested that certain ground-frequenting migratory bird hosts may, by transporting the tick, serve as agents in the extensive distribution of the virus. This tick is found throughout the United States and probably acts as a natural reservoir in areas in which carriers that attack man do not occur and in which no cases of the disease have been recorded. There is also little reason to doubt that *D. p. marginatus* has long been a natural carrier of the virus, but no investigations have yet been undertaken to demonstrate its presence in it in nature. The other species, unlike these two, attack man, but if they are to act as vectors, one or more stages must also infest susceptible small mammals, through which it has been generally assumed that tick-to-tick transfer of the virus must take place. There is no available information concerning the hosts of the larvae and nymphs of *D. r. occidentalis*, but it appears certain that they infest small mammals, particularly as *Bacterium tularense* has been found in them [xvii, 172]. Two cases of Rocky Mountain spotted fever have been reported within the range of this tick, but both localities are also within the range of *D. variabilis*, and there is no evidence to establish the responsibility of either. Transmission tests with *R. sanguineus* over a period of two years show that it is a very efficient vector under experimental conditions, but no information has been obtained as to the extent to which it infests susceptible mammals. *A. americanum* appears most likely to be an agent of human infection because of the frequency with which it infests man, the wide range of its hosts, which include susceptible small mammals, its known occurrence for many years in sections in which the disease now appears to be endemic, and reports that suggest that it may already be a vector. Although *A. cayennense* attacks man and has a wide host range, there is little evidence that it infests potentially susceptible hosts, and as it is unlikely to extend its range to any great distance north of the Mexican border, its importance as a vector, so far as the United States is concerned, will be limited. It seems likely that experimental transmission could be demonstrated in numerous species of Ixodids, but most of them are of no interest as possible natural vectors, owing to their host relations. Data on the distribution of the ticks discussed show that one or more of them are present in practically all parts of the United States.

HINMAN (E. H.). **Hereditary Transmission of Infections through Arthropods.**—*Amer. J. Trop. Med.*, xiii, no. 4, pp. 415–423, 27 refs. Baltimore, Md., July 1933.

The following is the author's summary : A brief literature résumé of the hereditary transmission of human infections by Arthropods is

presented. This mechanism of transmission is of considerable importance in the epidemiology of these diseases and in a few instances is probably the normal method by which the parasite reaches man. It is also of great significance in the propagation and maintenance among animal reservoirs. Attention is called to the occasional presence of micro-organisms within the ova of mosquitos [*R.A.E.*, B, xx, 209]. While as yet there is no experimental proof that the etiological agent of any human infection may be hereditarily passed through the mosquito, additional research may modify the present views on this subject.

PAILLOT (A.). **L'infection chez les insectes. Immunité et symbiose.**—Med. 8vo, 535 pp., 279 figs., 50 pp. refs. Trévoux, 1933.

It is suggested that the unsuccessful results obtained in attempts to utilise insect diseases in the control of pests may have been due to insufficient knowledge of the pathology of invertebrates. For this reason investigations on the subject were begun in 1912, and the information so far obtained, although far from complete, forms the subject matter of this monograph.

The first four sections of the work deal with diseases caused by protozoa, fungi, viruses and bacteria, the fifth with anti-bacterial immunity, and the sixth with symbiosis in Aphids (the only group in which this subject has been studied). The seventh comprises a review of the attempts made to utilise fungi or bacteria for the control of agricultural pests, and a summary of the part played by Arthropods in the transmission of diseases of man and animals. Author and subject indices are appended.

PAPERS NOTICED BY TITLE ONLY.

PURI (I. M.). **Studies on Indian Simuliidae. Part VIII. Descriptions of Larvae, Pupae, Males and Females of** *S. aureohirtum* **Brunetti and** *S. aureum* **Fries.**—*Ind. J. Med. Res.*, xxi, no. 1, pp. 1–9, 1 pl., 1 fig., 9 refs. **Part IX.** *S. equinum* **var.** *mediterraneum* **Puri and** *S. paraequinum* **sp. n.**—*T.c.*, pp. 11–16, 1 pl., 7 refs. Calcutta, July 1933.

BARRAUD (P. J.). **Additional Records of the Distribution of Anopheline Mosquitoes in India (from January 1, 1931 to April 15, 1933).**—*Rec. Malar. Surv. India*, iii, no. 3, pp. 507–525, 2 refs. Calcutta, June 1933. [*Cf. R.A.E.*, B, xv, 96; xix, 216.]

GATER (B. A. R.). **Notes on Malayan Mosquitoes, III. The Larval Forms of** *Anopheles aitkeni* **James.**—*Malayan Med. J.*, viii, no. 2, pp. 96–101, 21 figs., 10 refs. Singapore, June 1933. [*Cf. R.A.E.*, B, xxi, 146.]

TEGONI (G.) & WILLIAMS AURELLI (B.). **Indice bibliografico della Malaria. VI. 1931.**—*Riv. Malariol.*, xii, Suppl., 122 pp. Rome, 1933. [*Cf. R.A.E.*, B, xx, 108.]

KEMP (H. A.), MOURSUND (W. H.) & WRIGHT (H. E.). **Relapsing Fever in Texas. I. The Identity of the Spirochete** [*Spirochaeta* (*Borrelia*) *novyi*, transmitted by *Ornithodorus turicata*, Dug.].—*Amer. J. Trop. Med.*, xiii, no. 4, pp. 425–435, 3 refs. Baltimore, Md., July 1933. [*Cf. R.A.E.*, B, xix, 116.]

ROBERTS (R. A.). **Biology of *Brachymeria fonscolombei* (Dufour), a Hymenopterous Parasite of Blowfly Larvae.**—*Tech. Bull. U.S. Dept. Agric.*, no. 365, 21 pp., 5 figs., 14 refs. Washington, D.C., May 1933. [Recd. September 1933.]

In view of the frequency with which it is reared from blow-fly larvae, the bionomics of *Brachymeria fonscolombei*, Duf., were studied in Texas from 1928 to 1932.

The following is taken from the author's summary : This Chalcid is widely distributed over Europe and North America and has been found in Asia. The egg is laid within the host larva and hatches on the third day. The parasite larva moves freely about within the body cavity of the host, and in warm weather completes its growth in 8–12 days, during which time the host pupates. The pupal stage of the parasite lasts 10–12 days. The pre-oviposition period may be very brief, oviposition under ideal conditions occurring on the first day of adult existence. Although several eggs may be deposited in a single host, only one parasite reaches maturity. The sex ratio is about 57 per cent. females to 43 per cent. males. Parthenogenetic reproduction may occur, producing males only. The duration of the life-cycle varies with the temperature, averaging 21 days at a mean temperature of 86–90°F., and 35 days at 65°F. At lower temperatures, some larvae overwinter in the final instar within the host pupae. Eight generations may occur at Uvalde, Texas, a portion of the eighth overwintering. Without food or water, at a temperature of 70–79°F., the adults live about 3·6 days. At higher temperatures this period is shortened. They lived 4·5 days when supplied with bananas and water, and 11 days when fed on honey.

B. fonscolombei is most active as a parasite of *Sarcophaga*, but readily parasitises *Synthesiomyia* and *Phormia*, and was frequently reared from *Lucilia* and *Calliphora*. It was rarely bred from *Cochliomyia macellaria*, F. (screw-worm fly), and it was found that when it parasitises this fly, both insects usually die. It breeds in fly larvae in carcasses of birds, rabbits, turtles and other small animals. At Uvalde the proportion of parasitised larvae in small carcasses was generally about one-third, and often much higher. Although this parasite shows little promise as a factor in the control of *C. macellaria*, it should be of value in association with other parasites and predators in reducing the blow-fly population, especially in view of its habit of attacking larvae in small carcasses that easily escape attention.

ROBERTS (R. A.). **Activity of Blowflies and associated Insects at various Heights above the Ground.**—*Ecology*, xiv, no. 3, pp. 306–314, 2 refs. Brooklyn, N.Y., July 1933.

In the course of studies in 1930 on the status of blow-fly parasites, it was found necessary to place the bait-containers in trees out of reach of dogs. It was suggested that the increased height might affect the extent of parasitism ; tests were therefore made in 1931 and 1932 in Texas with jars containing meat exposed at various levels, allowing blow-flies and associated insects to breed in it. From the 80 baits exposed, 2,099 blow-flies, 1,823 blow-fly parasites, and 4,937 predatory and meat-infesting beetles were collected or reared. Of all these insects, 36·4 per cent. were taken at ground level, 29·7 per cent. at 15 ft., 20·7 per cent. at 30 ft., and 13·2 per cent. at 45 feet. Considering the blow-flies separately, the corresponding percentages were : *Sarcophaga* spp. (of

which probably 85 per cent. were *S. plinthopyga*, Wied.), 21·16, 15·32, 35·16, and 28·36 ; *Fannia femoralis*, Stein, 10·46, 42·48, 45·75 and 1·31 ; *Cochliomyia macellaria*, F., 60·32, 39·68, 0 and 0 ; *Synthesiomyia nudiseta*, Wulp, 100 at ground level, *Lucilia eximia* Wied. (*hirtiforceps*, Shannon) 53·66, 0, 19·51 and 26·83 ; *Ophyra aenescens*, Wied., 5·56, 94·44, 0 and 0 ; *L. mexicana*, Macq. (*unicolor*, Towns.) 0, 7·69, 53·85 and 38·46 ; and *O. leucostoma*, Wied., 100 at 15 ft. Although *L. hirtiforceps* and *L. caesar* were taken in small numbers, their prevalence in the upper jars indicates that *Lucilia* occurs in trees and at high levels as well as near the ground. *L. caesar*, the more abundant of the two, is prevalent in spring, autumn and winter. Although *L. sericata*, Mg., is common during the summer, it did not emerge from the baits. *Brachymeria fonscolombei*, Duf., a solitary parasite of blow-fly larvae, increased in abundance with increased height, the emergence being 14·63 per cent. at ground, 21·19 at 15 ft., 26·64 at 30 ft. and 37·54 at 45 ft. It is doubtful whether all the flies are hosts of the parasite, but it has been bred from *Sarcophaga*, *Cochliomyia*, *Synthesiomyia* and *Lucilia*. The percentage of parasitism on total emergence of all flies was 31·77, and on flies excluding *Fannia* and *Ophyra* 33·65. Predatory beetles do not affect this percentage, as parasitised and unparasitised larvae are destroyed alike. All the flies are attacked by the pupal parasite, *Mormoniella vitripennis*, Wlk., of which 36 individuals emerged at 15 ft. and 796 on the ground, representing respectively 2 and 27 blow-flies destroyed. The average percentages of parasitism by each of these parasites at the different heights were rather higher than in 200 baits exposed as controls in the surrounding area.

Of the beetles found, 76 per cent. were in the two lower baits where they probably prevented the percentage of flies from being greater. *Dermestes caninus*, Germ., comprised 83 per cent., but it is not an active predator on blow-flies. Histerids of the genus *Saprinus*, the most important predators found, represented 15·78 per cent. of the collection, 79·59 per cent. being taken on the ground and 8·09 per cent. at 45 ft.

MAYNE (B.). **The Injection of Mosquito Sporozoites in Malaria Therapy.**—*Publ. Hlth. Reps.*, xlviii, no. 31, pp. 909–916, 1 ref. Washington, D.C., 4th August 1933.

Sporozoites of *Plasmodium vivax*, *P. falciparum* and *P. malariae*, isolated from the salivary glands of mosquitos and suspended in sodium citrate (alone or mixed with freshly drawn defibrinated human blood enriched with 1 per cent. dextrose), were kept for periods varying from 1 hour to 5 days and 1 hour, and on subsequent injection into patients for the purpose of malaria therapy successfully induced infection.

BENGTSON (I. A.). **Seasonal Acute Conjunctivitis occurring in the Southern States.**—*Publ. Hlth. Reps.*, xlviii, no. 31, pp. 917–926, 14 refs. Washington, D.C., 4th August 1933.

In the course of a study on trachoma in southern Georgia, it was found that a seasonal acute conjunctivitis, probably transmitted by *Hippelates pusio*, Lw., is widely spread in that section of the country. The incidence of the disease is somewhat limited among adults, but almost all young children are affected. The fly appears about May and is active until the first frost in the autumn. Reference is made to previous observations on its bionomics [*cf. R.A.E.*, B, xxi, 38].

Attempts to isolate the Kochs-Weeks bacillus (the principal organism concerned in the disease in Georgia) from flies collected in the vicinity of the eyes of infected children were unsuccessful, owing to the growth of numerous saprophytic organisms on the culture.

SIMPSON (W. J.). **Insect Control at Sewage Plants.**—*Sewage Works J.*, v, no. 1, pp. 103–105. January 1933. (Abstr. in *Publ. Hlth. Engng. Abstr.*, xiii, p. S.54. Washington, D.C., 12th August 1933.)

Control of *Psychoda alternata*, Say, a troublesome pest in sewage plants in the United States [*cf. R.A.E.*, B, xx, 110 ; etc.], depends to a certain extent on the construction of the filter beds, the efficiency of the clarifier, the load placed on the beds, the maintenance of surrounding grounds, and geographical conditions. Liquid chlorine and calcium hypochlorite are effective against the larvae [vii, 24], but have no effect on adults other than retarding their multiplication for a short time. Kerosene with 25–50 per cent. orthodichlorobenzene makes a spray that remains effective for several days. Barriers of tall-growing trees are recommended to retard migration.

BRUMPT (E.). **Hôtes vecteurs vicariants du virus de la fièvre pourprée des Montagnes Rocheuses.**—*C. R. Soc. Biol.*, cxiii, no. 28, pp. 1362–1366. Paris, 1933.

A brief account is given of experiments carried out in Paris on the transmission by various species of tick of a strain of the virus of Rocky Mountain spotted fever obtained from the United States. *Dermacentor reticulatus*, F., was used for the conservation of the virus in order to avoid laboratory infections, as this species does not appear to attack man in France. Transmission from guineapig to guineapig was obtained with nymphs infected as larvae and with adults infected as nymphs. It was also found possible to transmit the disease by removing infected ticks from one healthy guineapig after two or more days and allowing them to become attached to a second and even a third animal, or by feeding uninfected nymphs on an infected guineapig for three days and subsequently placing them on normal guineapigs. Negative results were obtained on inoculation of a suspension of larvae from infected females, but two guineapigs were infected on inoculation with a suspension of tick faeces. Transmission was also obtained by the biting of adults of *Rhipicephalus sanguineus*, Latr., and *Amblyomma cayennense*, F., infected as nymphs. A guineapig bitten by 25 adults (infected as nymphs) of *Haemaphysalis concinna*, Koch (which is common in France on cattle and sheep) showed an almost typical febrile reaction from the 9th to the 13th day, but it has not yet been proved that this was due to Rocky Mountain spotted fever.

BRUMPT (E.). **Etude de la fièvre récurrente sporadique des Etats-Unis, transmise dans la nature par** *Ornithodorus turicata.*—*C. R. Soc. Biol.*, cxiii, no. 28, pp. 1366–1369.

BRUMPT (E.). **Etude du** *Spirochaeta turicatae*, **n. sp., agent de la fièvre récurrente sporadique des Etats-Unis transmise par** *Ornithodorus turicata.*—*T.c.*, pp. 1369–1372. Paris, 1933.

From a study of the literature and from his own experiments with a strain of *Ornithodorus turicata*, Dug., obtained from Mexico in 1926

and reared in Paris, the author concludes that this tick is almost incapable of maintaining or transmitting *Spirochaeta hispanica*, *S. duttoni* or *S. venezuelensis*. On the other hand, transmission took place in almost all tests with the spirochaete causing relapsing fever in Texas (and probably also responsible for numerous cases in California and Colorado), using a strain isolated from *O. turicata* collected in a cave in the Colorado River valley [*cf. R.A.E.*, B, xix, 116] and two strains isolated from man in Texas. The infection was transmitted by the bites of ticks to mice, rats and *Peromyscus*, but not to *Citellus citellus*, Moroccan palm rats (*Atlantoxerus getulus*) or a guineapig. Spirochaetes were found in the blood of mice 3 days after they had been bitten. Guineapigs were scarcely susceptible when inoculated. The infection was transmitted by larvae, nymphs and adults of either sex, and also appears to be hereditary, since in the one case thoroughly studied, 40 per cent. of the larvae were infective. When nymphs were inoculated into mice in small batches each day for 15 consecutive days after feeding on an infected rat, all the animals contracted the disease. Adults of the strain from Mexico that had been maintained uninfected in the laboratory for a number of years were shown by experiment to have retained their power to transmit the disease. Negative results were obtained in attempts transmit it by the bites of *Ornithodorus moubata*, Murr., *O. nicollei*, Mooser, *O. talaje*, Guér., and an undescribed species from South America that has been reared by the author for several years, thus refuting the view that any spirochaete may be transmitted by any tick of this genus [*cf.* xvii, 62]. Immunity and cross-immunity tests with the three United States strains were so inconclusive that no attempts were made to carry out further cross-immunity tests with other species of spirochaetes. On the other hand, the fact that these three strains are transmitted with equal facility by *O. turicata* is considered by the author to be sufficient proof of their identity, and as they are transmitted by a tick practically incapable of transmitting other species of spirochaetes tested, he suggests that they constitute a distinct species, for which he proposes the name *Spirochaeta turicatae*. He also considers that the possibility that they are identical with *S. novyi* cannot be proved, as he doubts whether a pure strain of this spirochaete has been maintained [but *cf.* xxi, 240].

ANDERSON (C.) & WASSILIEFF (A.). **Note sur un nouveau spirochète récurrent pathogène pour l'homme, rencontré chez** *Ornithodorus erraticus* **du Sud tunisien.**—*C. R. Soc. Biol.*, cxiii, no. 28, pp. 1408–1409. Paris, 1933.

The authors record the finding of a spirochaete in *Ornithodorus erraticus*, Lucas, from burrows of *Meriones shawi* in southern Tunisia. From experiments in laboratory animals and from cross-immunity tests, it is concluded that it belongs to the group of *Spirochaeta hispanica*. In a porcupine, the disease produced was of brief duration with visible spirochaetes; in *Meriones* it was inapparent; and in man it was rather severe and of the typical relapsing type. The tick has been found in both northern and southern Tunisia, but although cases of relapsing fever have been observed in the north [*cf. R.A.E.*, B, xx, 247], this is the first record of the spirochaete in the south.

REYNAL (J.) & WASSILIEFF (A.). **Prophylaxie de la peste à Tunis. La station municipale de surveillance murine : Laboratoire du rat. Son fonctionnement pendant une année (mai 1931–avril 1932) ; (mai 1932–avril 1933).**—*Arch. Inst. Pasteur Tunis*, xxi, no. 1, pp. 181–207, 1 pl., 10 refs. ; xxii, no. 1, pp. 122–136, 5 pls. Tunis, 1932–33.

In these two reports on the work carried out by the Plague Prevention Service of Tunis during the years 1931–32 and 1932–33, notes are given on the species of fleas taken on rats. In each year, *Xenopsylla cheopis*, Roths., was by far the most numerous, comprising about 94 per cent. of the total. The flea-index for the town was low, being 1·2 for 1931–32 and 1·1 for 1932–33.

SERGENT (A.). **Un nouvel agent de transmission naturelle de la récurrente hispano-africaine : la tique du chien** (*Rhipicephalus sanguineus*).—*C. R. Acad. Sci. Fr.*, cxcvii, no. 14, pp. 717–718, 1 ref. Paris, 1933.

The case of relapsing fever due to a spirochaete of the group of *Spirochaeta hispanica* reported from Algeria [*R.A.E.*, B, xxi, 230] was investigated with a view to determining the reservoir and vector of the spirochaete. Of 9 tests, in each of which the brains of 10 sewer rats from the neighbourhood were inoculated into guineapigs, one gave positive results. Transmission to guineapigs was not obtained by the bites or by inoculation of some of the numerous ticks (*Ornithodorus*) found in the burrows of the rats. The patient's dog was infested with *Rhipicephalus sanguineus*, Latr., which attacks both rodents and man. Two guineapigs, each inoculated under the skin with one of the ticks from this dog, both became infected. To determine whether this tick can transmit infection by biting, nymphs that had engorged as larvae on infected guineapigs were placed on four healthy ones, two of which were young. After 17 days, one of the young animals showed acute infection.

STEWART (J. L.). [Report of the] **Veterinary Laboratory.**—*Rep. Dept. Anim. Hlth. Gold Coast 1932–33*, pp. 11–18. Accra, 1933.

The clearing on a tributary of the River Volta discussed in the previous year's report [*R.A.E.*, B, xxi, 11] was completed before the rains in 1932. Although tsetse-flies were caught in their usual numbers in the uncleared areas, only 79 were taken in the cleared area throughout the year, all of which were *Glossina tachinoides*, Westw., except for two females of *G. palpalis*, R.-D. Only one was caught in that part of the cleared area where the débris had been burned, 16 were taken close to the river round pools where clearing had been imperfect, and the rest were found under fallen trees and brushwood. In the 1932–33 dry season, the flies were taken in small numbers above and below the cleared area ; this may have been due to more thorough catching or to the fact that the river had been in flood for a much shorter period than usual in 1932. During the early rains, they were abundant in both these areas. It thus appears that the original theory that the *Glossina* population dies out during the floods and is later renewed by migrations from the River Volta is improbable, since it would be almost impossible for large numbers of migrating flies to pass over the cleared area without being seen or caught. It was found useless to clear only the mouths of

the wet-weather streams [*cf. loc. cit.*], as flies were found round pools in the stream-bed far from the main river, but little additional labour is necessary to clear the whole length of these streams, as the undergrowth is not continuous. It is suggested that, in areas where *G. tachinoides* and *G. palpalis* are present, clearing would eliminate them, and the gradual removal of animals infected with trypanosomiasis from herds of cattle would prevent mechanical infection by means of other biting flies.

A list is given of the ticks identified during the year, with a brief note on the seasonal distribution of ticks in general. A disease due to *Theileria parva* or an allied organism is widespread in cattle, and *Rhipicephalus appendiculatus*, Neum., the vector of the *T. parva* group, is common. Heartwater was demonstrated in cross-bred English Alpine goats ; *Amblyomma hebraeum*, Koch, the vector of this disease, is also present.

NAPIER-BAX (S.). **Task-work** *versus* **Day-work Methods in Anti-tsetse Clearings.**—*Trop. Agriculture*, x, no. 9, pp. 249–254, 4 pls. Trinidad, September 1933.

The experiments described show that labour engaged in the clearing of bush incidental to the control of *Glossina* in Tanganyika Territory may be more profitably employed on the piece-work principle than on the day-work principle that was previously in force.

MOREAU (R. E.). **The Food of the Red-billed Oxpecker,** *Buphagus erythrorhynchus* **(Stanley).**—*Bull. Ent. Res.*, xxiv, pt. 3, pp. 325–335, 1 ref. London, September 1933.

In East Africa, the red-billed oxpecker or tick-bird (*Buphagus erythrorhynchus*) obtains its food on the bodies of the larger Herbivora, feeding apparently on Arthropod parasites and on the raw tissue of wounds. As these birds must be of economic importance to stock owners and as no account of investigations on their feeding habits occurs in the literature, an attempt was made to determine whether their activities are injurious or beneficial. An examination of the stomach contents of 55 birds revealed among other material a preponderance of ticks (2,291, of which the 812 identifiable ones are listed) and numerous flies, probably nearly all blood-sucking. Thus the suggestion that this bird does not eat ticks is disproved, ticks and other blood-sucking parasites probably forming the major part of its diet. The evidence that it makes holes in the hides of stock for the purpose of feeding on living tissue is slight, although it certainly feeds at sores and abrasions already present and consequently tends to cause more injury in herds that are in bad general condition. Its potentialities in the mechanical transmission of disease are, however, offset by its consumption of invertebrate vectors.

CARMICHAEL (J.). **The Virus of Rinderpest and its Relation to** *Glossina morsitans*, **Westw.**—*Bull. Ent. Res.*, xxiv, pt. 3, pp. 337–342, 9 refs. London, September 1933.

In view of the observations in Uganda and other parts of Africa that an outbreak of rinderpest is followed by the apparent disappearance or marked diminution in the numbers of *Glossina morsitans*, Westw., the experiments described were undertaken to test the effect of the

rinderpest virus on this species of fly [*cf. R.A.E.*, B, viii, 10]. Flies, whether in containers or free in the insectary, fed readily on both healthy cattle and those infected with a strain of the rinderpest virus isolated from a naturally infected eland, even when they were in an advanced stage of the disease. The results indicate that the virus, as it exists in the peripheral blood of infected animals, in no way affects *G. morsitans*, either directly when feeding, or indirectly by modifying the rate of reproduction or the fertility of the pupae.

SALITERNIK (Z.). **The Breeding of *Anopheles mauritianus* in Palestine.**—*Bull. Ent. Res.*, xxiv, pt. 3, pp. 343–344. London, September 1933.

In June 1929, a single female of *Anopheles coustani*, Laveran (*mauritianus*, Grp.) was collected, in association with numbers of *A. sacharovi*, Favr (*elutus*, Edw.), from the cellar of a house situated in a swamp. In July 1930, two pupae were taken from farther up the river that runs through the swamp, and in 1932, this species was found breeding, in association with *A. hyrcanus*, Pall., and *A. algeriensis*, Theo., in a small pool on the bank of the river during July and August, and in September in six other places (five of which were within 110 yards of the first pool) in association with *A. hyrcanus*. The characteristics of the breeding-places are described, and the results of an analysis of the water recorded. Eight females were taken out of doors, but none was found in a house 10–110 yards from the five main breeding-places, although it was the only one within three miles.

MACKERRAS (M. J.). **Observations on the Life-histories, Nutritional Requirements and Fecundity of Blowflies.**—*Bull. Ent. Res.*, xxiv, pt. 3, pp. 353–362, 25 refs. London, September 1933.

A detailed account is given of observations on *Lucilia sericata*, Mg., *L. cuprina*, Wied., *Chrysomyia rufifacies*, Macq., *Calliphora stygia*, F., and *C. augur*, F., made at Canberra over a period of two years in the course of breeding stocks of blow-flies for the study of experimental strike in sheep. A few notes were also made on the tertiary fly, *Peronia rostrata*, R.-D.

The following is largely taken from the author's summary: The flies were bred through many generations, in artificial light as well as in sunlight, and inbreeding had no effect on activity, fecundity or length of life. A diet of protein is necessary for the maturation of ova, but not of spermatozoa. Oviposition is not strictly associated with a suitable larval environment, but is more in the nature of a response to a tactile stimulus. Pairing appears to provide some essential stimulus for oviposition. Unfertilised females did not lay eggs. It is possible to cross the two closely related species of *Lucilia*, and the characters of *L. cuprina* appear to be dominant, but it is unlikely that this cross occurs in the field. A total of 2,373 eggs was laid by a female of *L. sericata*, both parent flies living 77 days, but the maximum number was obtained from the female of a pair of hybrid *Lucilia*, which lived 94 days and laid 3,171 eggs, from which 2,724 adults were reared. The number of eggs that a fly can produce at one time is dependent on its size and thus on the amount of food it obtained in the larval stage. Starvation in the larval period did not have a marked effect on the sex-ratio [*cf. R.A.E.*, B, xvii, 54], which in *Lucilia* is close to 1 : 1.

LEWIS (D. J.). **Observations on *Aëdes aegypti*, L. (Dipt. Culic.) under controlled Atmospheric Conditions.**—*Bull. Ent. Res.*, xxiv, pt. 3, pp. 363–372, 5 figs., 13 refs. London, September 1933.

The following is the author's summary : Methods of breeding and manipulating *Aëdes aegypti*, L., are described. Experiments on length of life were carried out with 534 mosquitos under 11 sets of conditions of atmospheric temperature and humidity. Also, 379 females were given an opportunity to suck blood under 11 sets of conditions. The following conclusions were reached : The length of life of starved mosquitos at 23°C. [73·4°F.] is very much dependent on humidity, but it cannot be directly related to saturation deficiency [*cf. R.A.E.*, A, xxi, 376, etc.]. In these experiments, there is no significant difference between the mean survivals of males and females, the former being generally longer. The survival periods of fed and unfed females have a similar relation to humidity, the fed ones surviving the conditions for a longer period, irrespective of the date of feeding. The effect of a change of temperature of 7°C. [12·6°F.] on the survival at 23°C. [73·4°F.] and 30°C. [86°F.] is much less than would be expected when the long survival period at 10°C. [50°F.] is considered. In the absence of any efficient physiological adaptation for retarding loss of water, the females, possibly for this reason, seek a blood meal mainly in saturated air at the temperature of maximum activity.

EVANS (A. C.). **Comparative Observations on the Morphology and Biology of some Hymenopterous Parasites of Carrion-infesting Diptera.**—*Bull. Ent. Res.*, xxiv, pt. 3, pp. 385–405, 12 figs., 22 refs. London, September 1933.

In the course of a study on the biological agencies regulating the abundance of *Lucilia sericata*, Mg., observations were made at Toulouse, France, on the Hymenopterous parasites of certain flies infesting carrion, including *Aphaereta minuta*, Nees, *Alysia manducator*, Panz., and *Mormoniella vitripennis*, Wlk., which oviposit in first and second instar larvae, third instar larvae, and puparia respectively. All were taken in the field. A few notes were also made for comparative purposes on *Aspilota nervosa*, Hal., parasitising half-grown larvae of a Phorid, *Megaselia* (*Aphiochaeta*) sp., from which it is recorded for the first time. *Aphaereta* was bred from *L. sericata*, *Calliphora erythrocephala*, Mg., and *C. vomitoria*, L., and *Alysia* from these three hosts and from *L. caesar*, L. Both these parasites hibernate as full-grown larvae in the puparia of their hosts. If the host hibernates in the larval stage, then pupation is " induced by parasitism " before the parasite larva has completed its development [*cf. R.A.E.*, B, xviii, 158]. *Mormoniella* hibernates as a larva. The oviposition of *Alysia* [*cf.* xv, 82] is described briefly, and that of *Aphaereta* in detail ; both species can oviposit through a layer of meat. Close observation of *Aphaereta* suggests that host larvae are selected by means of sense-organs situated in the tarsi [*cf.* xiv, 223] rather than in the palp-like organs of the ovipositor sheath [*cf.* xv, 82], and that both this species and *Alysia* locate larvae hidden under a layer of meat by detecting with the tarsi the vibrations in the meat set up by their movements. The female reproductive systems, the poison-gland systems and the eggs of the four species of parasites are compared. The number of eggs found in a single host larva is 10–20 of *Mormoniella*, 10–15 of *Aphaereta*, 1–2 of *Alysia* and 1 of *Aspilota*. The development of all four species

is described in detail. At a mean temperature of 17·5°C. [62·6°F.], the eggs of *Aphaereta* in *C. erythrocephala* hatch after 9 days, when the puparium of the host is formed, after which no further development of the host pupa occurs. At the same temperature in the same host, incubation in *Alysia* occupied a little more than 4 days, the host having pupated on the third day. The first larval instar lasts for a minimum period of 4–5 days, but the lengths of the second and third vary in different individuals. Parasitism sometimes prolongs the prepupal period of the host from 2½ to 10 days, and the development of the parasite is retarded, possibly owing to a nutritional factor, as the fat-body of the host does not begin to disintegrate until 1 or 2 days after pupation. The apparently ectoparasitic characters remaining in *Alysia* (which are discussed) suggest that this species has not reached such an advanced state of endoparasitism as *Aphaereta* or *Aspilota*. In *Aspilota*, the development of the egg and first-instar larva takes place during the larval stage of the host and that of the second and third instars inside the host puparium. In *Mormoniella*, of which only males (produced parthenogenetically) were studied, the incubation period was about 4 days and the larval period 6 days. The adaptations to endoparasitism found in the larvae of the parasites dealt with are discussed in comparison with the characters of a true ectoparasite, *Microbracon* (*Habrobracon*) *brevicornis*, Wesm. The differences in the amounts of growth taking place in the egg and larval stages of *Aphaereta* and *Alysia* appear to be correlated in some way with the different states of the body-fluids of the host, and these in turn are dependent on the different types of metabolism in progress within the host at the time of oviposition.

Neveu-Lemaire (M.). **Les arthropodes hôtes intermédiaires des helminthes parasites de l'homme.**—*Ann. Parasit. hum. comp.*, xi, nos. 3–5, pp. 222–237, 303–319, 370–402, 5 pp. refs. Paris, 1933.

Brief notes are given on the Arthropods recorded in the literature as intermediate hosts of helminths that parasitise man, a list of the insects with the worms that they harbour being also given.

Brumpt (E.). **Utilisation des larves de certaines mouches pour le traitement de l'ostéomyélite et de diverses affections chirurgicales chroniques.**—*Ann. Parasit. hum. comp.*, xi, no. 5, pp. 403–420, 2 pls., 1 fig., 4 pp. refs. Paris, 1933.

After quoting at some length observations of workers in and before the nineteenth century on the effect of live maggots occurring in wounds, the author points out that *Lucilia sericata*, Mg., which is used for the treatment of osteomyelitis [*cf. R.A.E.*, B, xx, 88, 125–129, etc.], is responsible for the loss of thousands of sheep each year in many parts of the world and has also been reported to cause myiasis of man in China. He therefore considers that there are probably races of this species, the larvae of one being capable of destroying healthy tissues whereas those of the other can be utilised with safety in surgery. *L. sericata* is common in France, but the author produced experimental myiasis with this strain in 1910, and he is therefore rearing for study a strain that has been successfully employed for the treatment of wounds in the United States. The information given on the technique of rearing the fly and sterilising the eggs was obtained from American workers. The method of applying the larvae, their

mode of action, and the use of the active principle obtained from them [*cf.* xx, 127] are discussed.

Pairing takes place 5–6 days after emergence and, at a temperature of 25°C. [77°F.] and a humidity of 40–60 per cent., eggs are laid 2 days later. The larvae, which hatch in a few hours, pupate in 5–7 days, the pupal period lasting 6–7 days. Under favourable conditions, the adults may live 2–6 weeks.

LÉPINE (P.). **Recherches sur le typhus exanthématique et sur son origine murine. Premier mémoire: Sur l'existence d'un typhus murin dans le bassin oriental de la Méditerranée et sur les caractères de ce virus.**—*Ann. Inst. Pasteur*, li, no. 3, pp. 290–376, 5 figs., 11 charts, many refs. Paris, September 1933.

The author reviews in detail the investigations that have been carried out since 1932 on murine typhus in Greece and its relation to endemic and epidemic typhus and Marseilles fever in man, some of the observations having already been noticed [*R.A.E.*, B, xx, 101 ; xxi, 142]. The first part of the paper deals with the reactions in laboratory animals of the virus occurring in the brains of rats of the eastern Mediterranean Basin. The second records the discovery of endemic typhus in man in Greece, its identity with the virus from rats, and its transmission by the ectoparasites of rats. The multiplication of the virus in *Xenopsylla cheopis*, Roths., was confirmed by experiments similar to those of American workers [xx, 144], positive results being obtained in a guineapig inoculated with 1/25,000th part of a flea. A survey of the fleas on the rats of Athens showed that 84·3 per cent. were *X. cheopis*. A naturally infected individual of *Ceratophyllus fasciatus*, Bosc, was found on a rat, and several fleas of the genus *Ctenocephalides* (*Ctenocephalus*) taken on cats were infected experimentally. Healthy rats placed in contact with infected individuals of *X. cheopis* were shown by subinoculations to have acquired the disease. An experiment in which fleas were infected from mice showed that the virus can be maintained in the flea for at least 4 weeks. A guineapig inoculated intraperitoneally with the faeces of infected fleas developed the disease after an incubation period of 5 days. The transmission of the disease by painting the gums of a rat with an emulsion of the brain of an infected guineapig on 3 consecutive days suggests that in nature an animal may be infected when catching its fleas [*cf.* xxi, 217]. Individuals of *Polyplax spinulosa*, Burm., on infected rats were found to be infected.

The third part deals with cross-immunity experiments and experiments with immune serum, which demonstrate clearly the distinctness of Marseilles fever from epidemic and endemic or murine strains of typhus. On the other hand, although immunity experiments appear to show a close relation between epidemic and murine typhus, differences in their behaviour in laboratory animals at the time of their isolation and in their epidemiology would appear to suggest that they are not identical. Thus the author agrees with Nicolle [xx, 245] that the two diseases are distinct, but considers that the possibility of one being transformed into the other has not been disproved. The difficulty of explaining how the epidemic virus is maintained between outbreaks if it does not develop from the endemic form is discussed at some length, and an account is given of the outbreak of typhus at Drama [xxi, 142], some features of which resembled the epidemic and others the endemic disease.

[Dryenski (P.).] **Дрѣнски (П.). Die parasitären Fliegen der Familie Oestridae in Bulgarien.** [Parasitic Flies of the Family Oestridae in Bulgaria.] [*In Bulgarian.*]—*Mitt. naturw. Inst. Sofia*, vi, pp. 125–149, 15 figs., 36 refs. Sofia, 1933. (With a Summary in German.)

Since very little is known about the Oestrids occurring in Bulgaria, where some of them are of great economic importance, notes, partly from the literature, are given on the characters and recorded hosts of the ten species observed by the author in various districts during the years 1925–1933. Of these, *Gastrophilus haemorrhoidalis*, L., *G. inermis*, Brauer, *G. intestinalis*, DeG., and *G. pecorum*, F. [*cf. R.A.E.*, B, xx, 206] occur in horses and other equines, *Oestrus ovis*, L., in sheep, *Rhinoestrus purpureus*, Brauer, in horses and mules, *Hypoderma actaeon*, Brauer, in red deer (*Cervus elaphus*), *H. diana*, Brauer, in red deer and chamois (*C. capreolus*), and *H. lineatum*, Vill., and *H. bovis*, DeG., in cattle. A general account is given of the bionomics of Oestrids, including some personal observations on those recorded, and the symptoms of infestation and remedial measures are briefly discussed. Contrary to data from the literature [xviii, 274], the author states that in the horse the larvae of *Gastrophilus* attach themselves to the mucous membrane of the pyloric division of the stomach and are seldom present in the cardiac division. Keys are given to the adults of all the species dealt with and to the larvae of the four species of *Gastrophilus*.

[Nenyukov (D. V.).] **Ненюков (Д. В.). Some Data on the Nutrition of the Larva of the Gad-fly** (*Hypoderma bovis*). [*In Russian.*]—*Wiss. Ber. mosk. St. Univ.*, i, pp. 35–38. Moscow, 1933. (With a Summary in English.)

An account is given of investigations in 1933 on the natural ferments and microflora of the alimentary tract of full-grown larvae of *Hypoderma bovis*, DeG., with a view to determining their rôle in the nutrition of the larvae. A brief description is given of the structure of the alimentary tract, which was found to be filled with the pus produced in the cavities under the skin of the infested animals, and the natural ferments and various bacilli obtained from different parts of it are discussed. It is concluded that they play an important part in digestion.

Klein (H. Z.). **Zur Biologie der amerikanischen Schabe** (*Periplaneta americana* **L.**). [On the Biology of the American Cockroach.]—*Z. wiss. Zool.*, cxliv, no. 1, pp. 102–122, 5 figs., 7 refs. Leipzig, August 1933.

This paper gives the results of laboratory investigations in Palestine. The following is taken mainly from the author's summary. The pre-oviposition period of *Periplaneta americana*, L., averaged 10 days at 26–28°C. [78·8–82·4°F.], 15 at 24–25°C. [75·2–77°F.] and about 6½ months below 20°C. [68°F.]. The formation of the egg-pods took 3 days in spring but only 1 in summer. None was formed or laid below about 20°C., the largest number being laid at the highest temperatures tested, 26°C. or over. A pod contained an average of 15 eggs, and the number laid by one female averaged 21·5, with a maximum of 46. The incubation period lasted 1–2 months, according to temperature. All the eggs in 37 per cent. of the pods and 6–8

per cent. of those in the remainder failed to hatch. The nymphs moulted 6 times and completed their development in 12–34 months. The percentage of mortality in this stage did not exceed 5–10, and special diet apparently had no effect on development. The adults lived on an average for 12 months, with a maximum of 21.

Three parasites of the egg-pods have been recorded in Palestine, *viz.*, *Evania appendigaster*, L., *E. punctata*, Brullé, and *Tetrastichus hagenowi*, Ratz.

MARSH (F.). **A new Species of** *Anopheles* (*Myzomyia* **Group) from South-west Persia.**—*Stylops*, ii, pt. 9, pp. 193–197, 1 pl., 5 figs. London, 15th September 1933.

Descriptions are given of the larva and adults of both sexes of *Anopheles apoci*, sp. n., which was reared from stagnant, brackish pools in south-western Persia. Its importance as a vector of malaria appears negligible.

MARSH (F.). **Anopheline Mosquitoes at Masjid-i-Sulaiman.**—*Ann. Rep. Med. Dept. Anglo-Persian Oil Co. 1932*, pp. 53–71, 22 pls., 6 graphs, 15 refs. London, 1933.

A study of the Anophelines at Masjid-i-Sulaiman in south-western Persia has been carried out intermittently since 1927. Descriptions are given of the female and larva of the 7 species taken, *viz.*, *Anopheles superpictus*, Grassi, *A. stephensi*, List., *A. pulcherrimus*, Theo., *A. d'thali*, Patt., *A. sacharovi*, Favr (*elutus*, Edw.), *A. sergenti*, Theo., and *A. apoci*, Marsh [see preceding abstract], and of the eggs of the first three. Only females of *A. sacharovi* and only larvae of *A. sergenti* have so far been collected (though a few females have been doubtfully attributed to the latter species), and the descriptions of the larva and female of these species respectively are based on the literature.

The long, hot, dry summers and cold winters of this region, together with the absence of sheltering vegetation, would appear to be unfavourable to mosquito breeding, but although the rivers and streams contract during the dry season (from about the end of April to November), numerous breeding-places are provided by small seepages and springs, by pools left in stream-beds, which are frequently fed by hidden springs, and by hoof-marks in the water-logged earth on the banks of trickling streams. Larvae are generally found in stagnant or slowly moving water that is clear, uncoloured, shallow and devoid of scum. Sunshine, on the whole or a portion of the water surface, seems essential, although the larvae appear generally to avoid the direct rays of the sun by burrowing in the sandy bottoms of their habitats. The water in the rivers, pools and springs is invariably hard, and often brackish, and the fact that vegetation in a pool, or at its edges, does not seem to attract larvae in this district, may be due to the thick layer of insoluble calcium salts with which the stems are covered up to the water level. A thick growth of algae in a pool forms a favoured shelter for the larvae. Although there are various types of breeding-place, it is rare in this region, except in the case of *A. superpictus*, to find larvae of one species only in any pool, however small.

A. superpictus, which is by far the most abundant species, breeds chiefly in streams, though it is found in almost every type of habitat.

Eggs were laid readily under laboratory conditions during summer or winter. During summer, the life-cycle from egg to adult occupied only 11 days ; in winter development was slower. The rate of growth of the larvae also varied with the suitability of the food-supply, being most rapid in tap water with tufts of grass and brown bread crumbs [*cf.* xvii, 183]. Adults bred from larvae or caught in nature lived for about 3 weeks in winter, but only one or two days in summer, doubtless owing to the extreme dryness of the atmosphere. *A. superpictus* and *A. sacharovi*, which are known to be able to fly for 4½ miles, as well as *A. stephensi*, *A. d'thali* and *A. pulcherrimus*, all three of which usually breed in association with *A. superpictus* but are not such strong fliers, enter houses and tents and bite readily. All these mosquitos except *A. d'thali* are known vectors of malaria, though *A. pulcherrimus* appears to be too scarce to be of much local significance. The adults doubtfully attributed to *A. sergenti* were taken in houses, and most of them had fed on man, but this species is also rare. Adults of *A. apoci* were never taken in houses.

During the summer, large numbers of mosquitos were found sheltering among the foliage of small garden plants with thick leaves and growing close together, such as lucerne, thickly sown maize, and particularly French marigolds [*Tagetes*]. Females were also found frequently in unoccupied caves and dug-outs, but during the winter the presence of birds or animals appears to be essential. In the early part of the winter, females could often be collected in large numbers in dark, warm cob-webbed and foetid stables, cow-sheds and hen-coops. A collection of females in these situations, continued for about three months from the middle of November, yielded 2,500 *A. superpictus*, 181 *A. sacharovi*, 132 *A. d'thali*, 22 *A. pulcherrimus*, 44 *A. stephensi* and 12 *A. sergenti*. The large number of *A. sacharovi* caught is of interest, in that this species was scarcely ever taken in European bungalows and no breeding was observed. The number of distinct breeding-places containing Anopheline larvae recorded each month showed a great increase in September–November, due almost entirely to *A. superpictus*. A comparison of the incidence of *Plasmodium vivax* and of *P. falciparum* in man shows that whereas the former remains fairly regular throughout the year (with small peaks in spring and autumn), the latter increases markedly between September and December. These observations would appear to support the suggestion that there is a relation between the incidence of *P. falciparum* and that of *A. superpictus*.

With regard to control measures, it is suggested that small springs and pools that have been found especially attractive to ovipositing females should be left undisturbed to act as traps, being treated once a week with a solution of cresol (1 : 20), which has been found to destroy the larvae without repelling the females. The usual anti-larval measures are effective, but owing to the ability of *A. superpictus* and *A. sacharovi* to fly long distances, the area under treatment should be extended to at least two miles beyond the periphery of the occupied areas and four miles to the south-west, the direction of the prevailing wind. In winter, large numbers of adults could probably be destroyed by spraying stables, etc., that are used as shelters with a solution of cresol (1 : 20) or by treating them at regular intervals with a non-repellent fumigant. In summer, the clumps of vegetation used as shelters could be sprayed with a dilute solution of sodium arsenite.

KINGSBURY (A. N.). **Annual Report of the Malaria Advisory Board (Federated Malay States) for the year 1932.**—Med. 8vo, 16 pp. Kuala Lumpur, 1933.

In continuation of the work on the production of a standard oiling mixture for use against Anopheline larvae in anti-malaria operations in Malaya [*R.A.E.*, B, xx, 199], field experiments were carried out with three selected mixtures containing heavy, solar and light oils in the proportions of 15–45–4, 42–22–0, and 35–25–4, respectively. All three mixtures appeared to give good results, but it was not possible to decide which was the most satisfactory. In view of the fact that, on certain estates in Perak, booms had been placed across oiled streams and the oil collected had been sprayed again on the streams, experiments were undertaken, which showed that the used oil was so inferior to the original mixture as to be almost valueless. The addition of 1 per cent. turpentine is reported to effect a great increase in the spreading power of petrol used for treating well water, particularly when it is polluted or vegetable growth is present. A method of subsoil drainage, using pipes made from sections of bamboo, is described. The total cost will depend on the life of the pipes, which have now been laid for 18 months; they must last three years for the method to be economically practicable.

An account is given by K. B. Williamson of the investigations on mosquito control that are being carried out in the Cameron Highlands, some of the information having already been noticed [xxi, 66]. The development of *Anopheles maculatus*, Theo., is considerably slower than in the plains, the life-cycle in outdoor cages lasting three weeks. Some of the adults lived for more than 90 days. Of 91 females dissected, 13 were infected with malaria parasites, 9 containing sporozoites. The incidence of malignant tertian malaria [*Plasmodium falciparum*] was found to increase with the decrease in altitude from the upper Highlands to the plains. In the locality where the investigations were being carried out, the night temperature averaged from 50–60°F., and it is suggested that this may account for the relatively small number of cases of malignant tertian malaria [*cf.* xxi, 100]. With regard to anti-larval measures, it was found in the laboratory that iron pyrites was ineffective after prolonged washing [*cf.* xx, 276]. Solid poisons that dissolve slowly, especially various forms of copper, gave promising results in the laboratory; brass and copper gauze, and copper soap coated on tins, stones and paper killed all larvae of *A. maculatus* in 3–4 days and continued to be effective after immersion for several months in running water. The resulting concentrations would probably be too low to be effective in the field in pools flooded by rain, and somewhat more soluble forms of copper would be necessary. Larvae reappeared in pools treated with white clay [*cf.* xxi, 66] as soon as it was washed away, and did not disappear again until the sides as well as the bottom of the pool had been replastered. This treatment is not advocated as a general measure, as breeding in such pools can usually be controlled more easily by other means; it does, however, indicate that soil is one of the factors that regulate breeding. In an experiment for larval control in stagnant or slowly running water not more than 2–3 ins. deep, grass, roughly chopped twigs with leaves, etc., were piled 12–18 ins. high and trampled into the water. This débris excludes light, acts as a mechanical barrier to adult mosquitos and pollutes the water (the pH in most cases falling to about 6·0). At intervals of 2–3 weeks, any

gaps occurring in the brushwood should be filled ; in stagnant water, larvae did not usually reappear in such spaces, but they were liable to do so if the water was running. The experiment has only been in operation for 3 months, but the results so far have been satisfactory.

The effect of using iron pyrites [xx, 276] does not appear to be permanent, as breeding increased in both treated and untreated drainage ditches nine months after the last application. A sample of the ore was found to contain 0·3 per cent. arsenic. The amount of iron present in the water of the treated drains was 0·6 parts Fe. per 100,000. The iron goes into solution as the sulphate and dissolves more readily than the arsenic ; the treated water is thus unlikely to be dangerous to health unless very large quantities are imbibed. The iron dissolves more easily when in contact with air and water and for this reason would probably be more effective in silt pits in which filling with water is intermittent.

McCulloch (R. N.). **A Kangaroo Louse infesting Dogs.**—*Agric. Gaz. N.S.W.*, xliv, pt. 8, pp. 617–619, 1 fig., 11 refs. Sydney, 1st August 1933.

Heterodoxus longitarsus, Piaget, was taken on dogs in New South Wales in 1933. Although it has been recorded on dogs elsewhere [*cf. R.A.E.*, B, xix, 23] and is undoubtedly a marsupial parasite of Australian origin, this appears to be the first record on dogs in Australia.

Simmons (J. S.), Kelser (R. A.) & Cornell (V. H.). **Insect Transmission Experiments with Herpes-encephalitis Virus.**—*Science*, lxxviii, no. 2020, pp. 243–246, 1 chart. New York, 15th September 1933.

This paper is a preliminary note on experiments begun in April 1933 with a laboratory-bred strain of *Aëdes aegypti*, L., to investigate the transmissibility by it of three strains of herpes viruses. The authors were unable to draw definite conclusions as to their transmissibility by this mosquito, but some of the results strongly suggested that transmission occurred.

Richardson (H. H.). **A Note on the insecticidal Efficiency of Kerosene Extracts of Derris alone and in Combination with Kerosene Extracts of Pyrethrum.**—*J. Econ. Ent.*, xxvi, no. 4, pp. 914–915, 3 refs. Geneva, N.Y., August 1933.

In tests in which kerosene extracts of derris (23·8 gm. powder containing 2·9 per cent. rotenone to 100 cc. kerosene) prepared by percolation were compared with kerosene alone against house-flies [*Musca domestica*, L.] according to a method previously described [*R.A.E.*, A, xix, 344], the time taken to paralyse 50 per cent. of the flies and the mortality after 24 hours were 332 seconds and 68 per cent. with the former and 405 seconds and 18 per cent. with the latter. The corresponding figures were 190 and 59 for a combination of 83·3 cc. kerosene extract of pyrethrum and 16·6 cc. derris extract as compared with 197 and 46 for 83·3 cc. pyrethrum extract and 16·6 cc. kerosene [*cf. R.A.E.*, B, xxi, 35 ; A, xxi, 565]. It has not been determined whether the toxicity of kerosene extract of derris is due to rotenone or to other constituents extracted, the solubility of rotenone in kerosene

having been reported at less than 0·1 per cent. at 20°C. [A, xviii, 690]. The addition of kerosene extract of quassia chips or hellebore did not appreciably increase the toxicity of kerosene.

Papers noticed by Title only.

French (C.) & Pescott (R. T. M.). **Household Insects and their Control. 2. Common Insect Pests.** [A popular account.]—*J. Dept. Agric. Vict.*, xxxi, pt. 8, pp. 401–409, 7 figs. Melbourne, August 1933.

Austen (E. E.). **New and little-known Species of** *Cuterebra* **Clark and** *Bogeria* **Austen (Diptera: Family Oestridae).**—*Proc. Zool. Soc. Lond.*, 1933, pt. 3, pp. 699–713, 1 pl. London, September 1933.

Bequaert (J.). **Notes on Hippoboscidae. 4. On the larger Species of** *Lynchia* **Weyenbergh** (*Olfersia* **of Authors;** *Icosta* **Speiser;** *Ornithoponus* **Aldrich)** [with key].—*Psyche*, xl, no. 2, pp. 68–82. Cambridge, Mass., June 1933.

Hase (A.). **Ueber heftige, blasige Hautreaktionen nach** *Culicoides*-**Stichen.** [On severe Blistering of the Skin caused by the Bites of *Culicoides*.]—*Z. Parasitenk.*, vi, no. 1, pp. 119–128, 2 figs., 29 refs. Berlin, 6th September 1933.

Peus (F.). **Zur Kenntnis der** *Aëdes*-**Arten des deutschen Faunengebietes (Dipt., Culic.). Die Weibchen der** *Aëdes communis*-**Gruppe.** [Contribution to the Knowledge of the Species of *Aëdes* of the German Faunistic Region. The Females of the Group of *A. communis*, DeG.].—*Konowia*, xii, no. 1–2, pp. 145–159, 11 figs. Vienna, 25th August 1933.

Taylor (F. H.). **A new Species of** *Finlaya* [*Aëdes* (*F.*) *littlechildi*] **(Order Diptera: Family Culicidae) from Papua.**—*Aust. Zool.*, vii, no. 5, p. 370. Sydney, 22nd August 1933.

Wagner (J.). **Nachtrag zur Kenntnis der letzten Abdominalsegmente der Flöhe.** [Supplement to the Knowledge of the last Abdominal Segments of Fleas (*Plocopsylla enderleini*, sp. n.).]—*Zool. Jahrb.*, Abt. Anat., lvii, no. 3, pp. 365–374, 11 figs., 1 ref. Jena, 8th August 1933. [*Cf. R.A.E.*, B, xx, 284.]

Marelli (C. A.). **El nuevo genero y especie,** *Pitrufquenia coypus*, **de malófago de la nutria chilena.**—*La Chacra*, iii, no. 26, pp. 7–9, 6 figs. Buenos Aires, December 1932. [Recd. October 1933.]

Marelli (C. A.). **El piojillo de la nutria argentina** *Pitrufquenia mollis* **n. sp.** [*P. mollis*, sp. n., the Louse of the Argentine Nutria.]—*Rev. Soc. ent. argent.*, v, no. 24, pp. 299–303, 1 fig. Buenos Aires, May 1933.

Ewing (H. E.). **A new Pit-producing Mite** [*Ophioptes tropicalis*, sp. n.] **from the Scales of a South American Snake.**—*J. Parasit.*, xx, no. 1, pp. 53–56, 2 figs. Urbana, Ill., September 1933.

Philip (C. B.). **The Occurrence of** *Ixodes auritulus* **Neum. in North America (Oregon)** [on *Passer domesticus*].—*Science*, lxxviii, no. 2016, pp. 145–146, 1 ref. New York, 18th August 1933.

Handschin (E.). **Studien an *Lyperosia exigua* de Meijere und ihren Parasiten. i. Teil. *Lyperosia exigua* in Java und Nordaustralien.** [Studies on *L. exigua* and its Parasites. Part i. *L. exigua* in Java and Northern Australia.]—*Rev. suisse Zool.*, xl, no. 3, pp. 449–528, 21 figs., 80 refs. Geneva, July 1933.

A more detailed account than one already noticed [*R.A.E.*, B, xx, 258] is given of investigations carried out in Java and northern Australia on *Lyperosia exigua*, de Meij., in 1930–32. All stages of the fly are described. The following is taken chiefly from the author's summary: The flies are attracted for oviposition to quite fresh dung of water buffalo, cattle and sometimes horses. The necessary water content of the dung is more than 65 per cent. Development is completed in the dung and takes 7–20 days at temperatures of 40–22°C. [104–71·6°F.]. During the dry season the fly disappears entirely from dry districts, withdrawing to places where moisture is still to be found and from which later fresh infestation occurs. The periodical wandering of cattle and buffalo in quest of water disseminates the flies that settle on them. In the mountainous districts of Java where the monthly mean temperature falls below 20°C. [68°F.], *L. exigua* does not occur. In Australia, it has not yet passed the tropical belt. Experiments at constant temperatures showed interruption of development at approximately 23°C. [73·4°F.]. Where the temperature falls below 68°F., development is not possible even with sufficient moisture.

Though in certain districts loss amounting to hundreds of thousands of pounds is due to *L. exigua*, the direct damage it causes has been over-estimated. Loss of weight in cattle is not due solely to its attack, but also to climatic and other conditions that cause the animals to roam and thus to lose weight. Moreover, though the irritation it causes prevents them from obtaining proper nourishment, it is less serious than the distress caused by Tabanids.

[Politov (A. K.).] **Политов (А. К.). An Experiment in the Application of Chloropicrin and Carbon Bisulphide in the Control of the Larvae and Pupae of Mosquitos.**—*Med. Parazit. parazit. Bolezni* [*Med. Parasit. & Parasit. Dis.*], i, no. 1, pp. 32–37, 16 refs. Moscow, 1932.

An account is given of experiments in the northern Caucasus on the action of chloropicrin and carbon bisulphide on larvae and pupae of *Anopheles* and *Culex*. Chloropicrin does not mix with water, but sinks to the bottom, though when it is applied as a spray, some of the drops remain on the surface of the water as greasy spots of varying dimensions. It is soluble in water to the extent of 10·65 gm. per litre at 18°C. [64·4°F.]. The time required to produce 100 per cent. mortality of the larvae in the laboratory varied from 3½ hours with 1 gm. chloropicrin per litre to 22 hours with 0·01 gm., the corresponding periods for pupae being 48 and 72 hours. With 10 gm. per litre, all larvae and pupae were killed within 10 minutes. At concentrations toxic to mosquito larvae, chloropicrin also destroyed other insects and aquatic plants, and *Gambusia* was killed within 4 and 18 hours by concentrations of 0·05–0·1 and 0·01 gm. respectively. On the other hand, a dog and a cat were not affected by drinking water treated with much higher concentrations for a period of two weeks.

Outdoor experiments were carried out in two pits (3¼ ft. wide, 6½ ft. long and 1½–4½ ft. deep) containing water infested with numerous

larvae and pupae of *Culex* and *Anopheles*, 100 gm. chloropicrin being sprayed on the surface of the water in one pit and placed at the bottom of the other in a receptacle. After 15 minutes, the mortality was high in the sprayed pit and negligible in that containing submerged chloropicrin, and on the following day the entire fauna of the former was dead, whereas in the latter a large number of the mosquito larvae and pupae, besides other animals, survived. Since, however, the latter method gave 100 per cent. mortality in the laboratory, it should be further studied, as it avoids the necessity for spraying equipment, and the chloropicrin remaining after treatment can be removed and used again.

Carbon bisulphide proved to be only one-fourteenth as effective as chloropicrin against mosquito larvae, though almost equally toxic to the pupae ; at concentrations of 10 and 0·3 gm. per litre, it killed all larvae and pupae in 1 and 52 hours respectively. The treated water had no detrimental effect on domestic animals.

HASE (A.). **Zur Fortpflanzungsphysiologie der blutsaugenden Wanze** *Rhodnius pictipes* **(Hemipt. Heteropt.). Beiträge zur experimentellen Parasitologie. 9.** [On the Physiology of Reproduction in the Blood-sucking Bug, *R. pictipes*. Contribution to Experimental Parasitology. 9.]—*Z. Parasitenk.*, vi, no. 1, pp. 129–144, 5 figs., 5 refs. Berlin, 6th September 1933.

An account is given of further investigations [*cf. R.A.E.*, B, xx, 239] on *Rhodnius pictipes*, Stål. In observations on 16 females, the number of eggs laid in the course of 91 days at 30–31°C. [86–87·8°F.] and under good feeding conditions ranged from 288 to 513, the greatest number laid on one day being 22. At this temperature and 76 per cent. relative humidity, the eggs hatched in 11–15 days, and the percentage that died was only 14·6, whereas at about 17–22°C. [62·6–71·6°F.] and about 60–70 per cent. humidity, the incubation period was 37–48 days, and the mortality 78·2 per cent. Moreover, half the resulting larvae were crippled and soon died.

WEYER (F.). **Beobachtungen zur Rassenfrage bei** *Anopheles maculipennis* **in Norddeutschland.** [Observations on the Question of Races of *A. maculipennis* in North Germany.]—*Verh. deuts. zool. Ges.*, xxxv, pp. 176–183, 8 refs. Leipzig, September 1933.

A brief account is given of the results of studies since the spring of 1931 on the value of various characters in differentiating the races of *Anopheles maculipennis*, Mg., in East Friesland, where malaria is endemic [see next paper and *R.A.E.*, B, xxi, 233]. Investigations were also made of the blood-meals of the mosquitos from dwellings and from animal quarters. In dwellings, in which their numbers were comparatively small, they were most common in summer, rare in autumn and absent in winter. It is probable that they attack cattle in the pasture as well as in cow-sheds. Of the mosquitos containing blood, most of those found in rooms and very few of those in stalls had fed on man. Both races (*atroparvus* van Thiel, and *messeae*, Falleroni) occur in stalls and bedrooms, but are more numerous in the former, and both feed on man and animals. Preference of a race for a given host could not be proved. Microclimatic preferences may be a factor in the relation of the races to malaria, as *messeae*

apparently prefers lower temperatures. If, after feeding, it seeks a temperature below 16°C. [60·8°F.] (the minimum at which the malaria parasite can mature), it cannot become infective even if it has fed on man.

Var. *atroparvus* occurs chiefly on the coast, on islands, and in inland brackish water regions, while *messeae* is found unmixed in lake regions or river valleys. The former was found to be common in districts in East Friesland where the water was slightly brackish. The salt-content was 0·1–0·3 per mille, which is less than the figure (1·3 per mille) in Holland; the latter degree of salinity was only found at Rügen. The larvae also occurred, however, in fresh water.

WEYER (F.). **Grösse und Maxillenzahl als Unterscheidungsmerkmal der Rassen von** *Anopheles maculipennis* **und ihre Beziehungen zur Umwelt.** [Size and Maxillary Index as Characters distinguishing the Races of *A. maculipennis* and their Relation to Environment.]—*Riv. Malariol.*, xii, fasc. 3, pp. 487–520, 10 graphs, 9 refs. Rome, 1933. (With Summaries in Italian p. 648, French p. 650, English p. 652, German p. 654.)

WEYER (F.). **Neuere variationsstatistische Ermittlungen über Flügellänge und Maxillenindex als Rassenmerkmal von** *Anopheles maculipennis*. [Recent Statistics on Variation in Wing-length and Maxillary Index as Racial Characters in *A. maculipennis*.]—*Zool. Anz.*, ciii, no. 9–10, pp. 244–253, 4 graphs, 5 refs. Leipzig, 1st August 1933.

The first paper deals in detail, and the second more briefly, with the results of observations in 1932 on the races of *Anopheles maculipennis*, Mg., in the malarious Emden district in East Friesland and in the non-malarious region of Schwerin, in continuation of work already noticed [*R.A.E.*, B, xxi, 233]. In 1932, the weather conditions were very different from those of 1931. Var. *atroparvus*, van Thiel (short-winged Dutch race) [called var. *labranchiae*, Falleroni, in the paper referred to] was almost unmixed in the Emden region, while var. *messeae*, Falleroni (long-winged Dutch race) occurred unmixed in Schwerin. In the Emden area, hibernation ended and began at the same dates as in 1931, and the first generation of adults again appeared early in June. Larvae of all instars were present in mid-September, but none was found at the end of October. The last egg-masses in nature were found about 20th September. Thorax and wing measurements and counts of maxillary teeth are recorded in detail. Var. *messeae* had a lower maxillary index than var. *atroparvus*; the difference was less than 1, but it was constant. Throughout East Friesland, *atroparvus* was, on average thorax and wing measurements, always smaller, the figures being more confirmatory of those obtained in Holland than they had been in 1931. The measurements of *messeae* from a newly discovered centre in Upper Bavaria agreed with those in North Germany. On the other hand some individuals of *atroparvus* from the island of Rügen and from East Friesland had greater wing-lengths than *messeae*. As variations in size in *atroparvus* appeared to be seasonal, it is concluded that they are caused by external factors, perhaps climate and breeding-places. In reaction to environment there was an evident difference between the two races, *messeae* being fairly constant in size. The existence of racial differences in size between *atroparvus* and *messeae*

was therefore not definitely ascertained, but this is unimportant, as better differential characters occur, and any such differences would be masked by individual ones due to environment.

Shannon (R. C.). **An Algerian Anopheline found in Greece (Diptera, Culicidae, *An. marteri*, S. & P.).**—*Riv. Malariol.*, xii, fasc. 3, pp. 521–522. Rome, 1933. (With Summaries in Italian p. 649, French p. 651, English p. 652, German p. 655.)

Anopheles marteri, Sen. & Prun., a species hitherto known only from Algeria [but *cf.* *R.A.E.*, B, xxi, 110], was found at an altitude of a little over 3,000 ft. in Macedonia. Larvae, pupae and adults were obtained in October 1932, and larvae in May 1933. The breeding-place was a small mountain stream [*cf.* xvi, 189]. A single larva of *A. claviger*, Mg., was taken in this stream, and several others in a marshy area about 1,000 ft. higher where larvae of *A. marteri* were not found.

Fermi (C.). **Diserbo biologico delle acque.** [The Biological Clearing of Aquatic Vegetation.]—*Riv. Malariol.*, xii, fasc. 3, pp. 523–531, 5 refs. Rome, 1933. (With Summaries in Italian p. 531, French p. 651, English p. 653, German p. 655.)

A sheet of water in Sardinia, which covered about 150 acres and in which mosquitos bred prolifically, was so full of aquatic vegetation that in some parts even *Gambusia* [*holbrooki*] was unable to penetrate. As a result of stocking with carp, the plants were completely cleared away and no mosquito larvae could be found. Their absence is attributed primarily to the free movement of the water and not to the presence of *Gambusia*.

Vanni (V.). **Ancora un progresso nella delarvizzazione dei Culicidi.** [A further Advance in the Control of Mosquito Larvae.]—*Riv. Malariol.*, xii, fasc. 3, pp. 532–534, 1 fig. Rome, 1933. (With Summaries in Italian p. 649, French p. 651, English p. 653, German p. 655.)

The author found that an impalpable dust obtained from the residue of low-temperature distillation of ichthyolic bituminous schists gave excellent results against mosquito larvae. The material is slightly greasy to the touch, and when thrown on water it spreads in an extremely thin, compact film over the surface without rendering the depths turbid, even after several weeks. The minute interstices that may occur between the particles are filled by oily droplets that separate from the dust on contact with water. The film is broken only by heavy rain or violent agitation of the surface and even then only a small portion of the dust sinks ; most of it floats again owing to the high surface tension of the oily particles. When water containing larvae of *Anopheles* and *Culex* was dusted with this material, the Anopheline larvae were the first to die, only a few surviving by breathing through fissures in the film. The Culicine larvae were more resistant, many being able to pupate, but the adults of both genera failed to pierce the cover and were drowned before emerging entirely from the pupal case. If mixed with Paris green, this powder should enable dusting to be done at longer intervals.

FUGAZZA (E.). **Osservazioni sulla zooprofilassi antimalarica fatta a Milano nel 1932.** [Observations on Anti-malarial Zooprophylaxis at Milan in 1932.]—*Riv. Malariol.*, xii, fasc. 3, pp. 535–539, 11 refs. Rome, 1933. (With Summaries in Italian p. 649, French p. 651, English p. 653, German p. 655.)

In 1932, the nature of the blood-meals of Anophelines was investigated at four farms near Milan. From July to October, about 1,200 Anophelines, chiefly *Anopheles maculipennis*, Mg., were caught, but as most of them were not engorged, only about 200 were used for the precipitin tests. The results indicated that they fed chiefly on cattle, irrespective of the numbers of the latter. Females containing bovine blood were taken in pigsties and fowlhouses, and those in cow-sheds contained bovine or human blood only. Horses were very attractive, but outside their stables only one mosquito with equine blood was taken. In one of two similar, clean, well-lit sets of animal quarters the mosquitos were distinctly less zoophilous than in the other. Of the small numbers taken in dwelling rooms, only a few contained sufficient blood for the tests, but it was noticed that a reduced distance between the animal quarters and the dwelling-house did not appear to reduce the percentage of mosquitos that had fed on man. No conclusions are drawn and the work is being continued.

VIANELLO (G.). **Un interessante caso di pediculosi dei fagiani.** [An interesting Case of Pediculosis in Pheasants.]—*Clinica vet.*, lvi, no. 8, pp. 596–601, 1 pl. Milan, August 1933.

A description is given of an infestation of pheasants in Italy by *Menopon fulvomaculatum*, Denny (*productum*, Piaget). Sickly birds should be killed and their bodies destroyed.

WHITEHEAD (W. E.). **Notes on a Mite infesting a Flea.**—*Sci. Agric.*, xiii, no. 12, pp. 751–752, 2 figs. Ottawa, August 1933.

Deuteronymphs of *Tyroglyphus* (*Tyrophagus*) *putrescentiae*, Schr., are recorded from beneath the tergites of fleas, *Ceratophyllus saundersi*, Jord., taken from a ground squirrel (*Citellus richardsoni*) in Canada. As the deuteronymph does not feed, it would appear to attach itself to fleas for purposes of transport.

WHITEHEAD (W. E.). **"Scalyleg" in wild Birds.**—*Sci. Agric.*, xiii, no. 12, p. 753, 1 fig. Ottawa, August 1933.

The Sarcoptid, *Cnemidocoptes fossor*, Ehlers, which was originally described from a captive weaver bird (PLOCEIDAE) in Germany, is recorded from the rusty grackle (*Euphagus carolinus*) in Canada. The only other record of "scaly-leg" in wild birds in North America is that of *C. mutans*, Robin & Lnq., on a willow grouse in British Columbia.

McLEOD (J. A.). **A Parasitological Survey of the Genus *Citellus* in Manitoba.**—*Canad. J. Res.*, ix, no. 2, pp. 108–127, 3 pls., 28 refs. Ottawa, August 1933.

The parasites obtained from 236 ground squirrels (*Citellus*) in Manitoba included two species of *Liponyssus*, *Dermacentor venustus*,

Banks, *Ceratophyllus bruneri*, Baker, and *Linognathoides montanus*, Osborn, all of which are described. *D. venustus*, adults of which were common on most of the animals examined in the early summer, is an important vector of tularaemia and Rocky Mountain spotted fever, of which the large ground squirrel population might act as a reservoir if they were introduced. This tick has also been responsible for a number of cases of tick paralysis. *C. bruneri* was found on almost all the ground squirrels examined; this flea may act as the vector of *Trypanosoma citelli* and as the secondary host of the tapeworm, *Weinlandia citelli*.

PALMER (J. H.) & CRAWFORD (D. J. M.). **Relapsing Fever in North America, with Report of an Outbreak in British Columbia.**—*Canad. Med. Ass. J.*, xxviii, no. 6, pp. 643–647, 2 figs., 15 refs. Montreal, June 1933.

The cases of relapsing fever that have been reported in the literature as occurring in North America are reviewed. Descriptions are given of six cases that occurred during 1930–32 in the West Kootenay district of British Columbia, and are the first ones to be recorded from Canada. Spirochaetes were found in the blood of two of the four examined. The vectors of relapsing fever in different parts of the world are discussed, and it is concluded that as neither lice nor bed-bugs are likely to have been concerned in the transmission of the Canadian cases, the probable vector is the wood tick, *Dermacentor venustus*, Banks (*andersoni*, Stiles), which is reported to be numerous in the district concerned.

DAVIS (G. E.) & PARKER (R. R.). **Additional Studies on the Relationship of the Viruses of Rocky Mountain Spotted Fever and São Paulo Exanthematic Typhus.**—*Publ. Hlth. Rep.*, xlviii, no. 33, pp. 1006–1011, 3 charts, 4 refs. Washington, D.C., 18th August 1933.

Further experiments [*cf. R.A.E.*, B, xxi, 189, 238] showed that guineapigs that had received Rocky Mountain spotted fever vaccine were protected in an equal degree against this disease and São Paulo exanthematic typhus. Moreover, complete cross-immunity was obtained in monkeys or guineapigs. J. L. Monteiro, who has carried out cross-immunity tests with similar results, reports that a vaccine prepared from *Amblyomma cayennense*, F., also confers protection against both diseases. Thus their essential identity appears to be well established.

LANE (J.). **Notas sobre a distribuição geographica dos culicideos (Diptera) de São Paulo.** [Notes on the geographical Distribution of the Culicids of São Paulo.]—*Rev. Biol. Hyg.*, iv, no. 2, pp. 72–75. São Paulo, August 1933.

The 21 mosquitos dealt with include four of the genus *Anopheles*, *viz.*, *A. tarsimaculatus*, Goeldi, *A. bachmani*, Petrocchi, *A. intermedius*, Chagas, and *A. bellator* var. *cruzi*, Dyar & Knab.

Pinto (C.) & de Souza Lopes (H.). **Anatomia, biologia e papel patogenico da** *Neivamyia lutzi*. [The Anatomy, Biology and Pathogenic Rôle of *N. lutzi*.]—*Arch. Esc. Agric. Med. vet.*, x, no. 1, pp. 77–88, 16 pls. Rio de Janeiro, June 1933.

In discussing the status of *Neivamyia lutzi*, Pin. & Fons. [*R.A.E.*, B, xix, 90] the authors maintain that its identity with *N. flavicornis*, Mall. [*cf.* xx, 14] cannot be established until the genitalia of the types of the two species have been compared. Further adult characters and the egg and larva are described. In Rio de Janeiro, *N. lutzi* has been found biting equines only, attacking them at twilight and settling by preference on the edges of wounds, especially those on the back and abdomen. A female taken sucking the blood of a horse on 20th June 1932 laid eggs which hatched on 23rd June after an incubation period of 9–10 hours. The larvae were placed on horse droppings, where they pupated between 2nd and 3rd July, 4 females emerging on 9th July. Larvae placed on cow-dung died. Of 22 Muscoid flies found carrying eggs of *Dermatobia hominis*, Say, 4 were *N. lutzi*.

Pinto (C.). **Profilaxia das babesioses e anaplasmose dos animaes domesticos do Brasil.** [The Prophylaxis of Anaplasmosis and Forms of Piroplasmosis of Domestic Animals in Brazil.]—*Arch. Esc. Agric. Med. vet.*, x, no. 1, pp. 99–131, 9 figs. Rio de Janeiro, June 1933.

This is a general account of anaplasmosis of cattle caused by *Anaplasma marginale* and of various forms of piroplasmosis in domestic animals, with special reference to Brazil. Notes are included on the ticks that transmit these diseases in various parts of the world, together with formulae for dips against them.

Davis (N. C.). **Transmission of Yellow Fever Virus by** *Culex fatigans* **Wiedemann.**—*Ann. Ent. Soc. Amer.*, xxvi, no. 3, pp. 491–495, 6 refs. Columbus, Ohio, September 1933.

In view of the inconclusive results obtained in previous experiments on the transmission of yellow fever by *Culex fatigans*, Wied. [*cf. R.A.E.*, B, xviii, 166 ; xx, 10], further tests were carried out at São Salvador, Brazil, using the more virulent Asibi (African) strain of virus. In two experiments, the disease was transmitted from infected to healthy monkeys (*Macacus rhesus*) by the bites of this mosquito after extrinsic incubation periods of 17 and 20–23 days respectively, the first monkey dying of typical yellow fever. In one lot of mosquitos, the virus was shown by injection to have survived for 39 days. It would appear that many of the mosquitos used were able to free themselves of the virus, and it seems probable that the number developing gland infection is small, or even that transmission takes place only through faecal contamination of the host. Considering its relative unsuitability as a host and its rather erratic feeding habits, it is probably only under exceptional conditions that *C. fatigans* might become a factor of importance in the transmission of yellow fever.

Coutieras Macaya (M.) & Macchiavello Varas (A.). **Le typhus exanthématique bénin à Antofagasta (Chili) en 1931 et 1932; étude clinique, épidémiologique et expérimentale.**—46 pp. Antofagasta, Publ. Serv. san. prov., December 1932. (Abstr. in *Bull. Off. int. Hyg. publ.*, xxv, no. 9, pp. 1613–1614. Paris, September 1933.)

From 1925 to 1931, no epidemics of typhus occurred in Antofagasta, but during the cold seasons of 1931 and 1932, 10 cases of benign typhus were recorded. Infection did not spread within families, and nearly all the infected persons lived in damp, dark dwellings in contact with animals. Rats are estimated to be three times as numerous as the inhabitants, and *Xenopsylla cheopis*, Roths., comprises 60 per cent. of the flea population [*cf. R.A.E.*, B, xxi, 105]. Rats would appear to constitute the reservoir of benign typhus in Antofagasta, possible vectors being *X. cheopis*, *Polyplax spinulosa*, Burm., and *Cimex lectularius*, L.

Shaftesbury (A. D.). **A Review of the Fleas of North Carolina with Special Reference to Sex Ratios. (Abstract)**—*J. Elisha Mitchell Sci. Soc.*, xlix, no. 1, p. 17. Chapel Hill, N.C., September 1933.

Ten species of fleas identified from common animals in North Carolina included a rat flea, *Ceratophyllus fasciatus*, Bosc, not previously recorded there. In all species collected in numbers, the females predominated, the percentage ranging from 61·5 in *Pulex irritans*, L., to 86 in *Echidnophaga gallinacea*, Westw.

Barrett (R. E.). **Epidemiological Observations on Plague in the Lango District of Uganda.**—*E. Afr. Med. J.*, x, no. 6, pp. 160–180, 2 pls., 17 refs. Nairobi, September 1933.

In the Lango District in the Northern Province of Uganda, plague has been endemic for many years but is confined almost exclusively to the denser rural native populations associated with the production of cotton in the central and south-eastern areas. A flea survey showed that *Xenopsylla cheopis*, Roths., which appears to be indigenous, is the prevalent rat flea, particularly on *Mus* (*Rattus*) *coucha ugandae* (the domestic rat of the district), and is probably the most important vector of human and rodent plague. *X. brasiliensis*, Baker, has a limited distribution, corresponding to, but rather less extensive than, that of *Mus* (*R.*) *rattus*, and it is suggested that both have been introduced within comparatively recent years. Their distribution corresponds approximately with that of plague, but as it had probably existed previously as a disease of *M. coucha*, it seems likely that its distribution is limited by the commercial intercourse that incidentally resulted in the introduction of this rat and this flea, though both are now probably of importance in its dissemination. The part played by other fleas and rodents is problematical. Examination of the clothes and personal belongings of 1,150 pedestrians yielded only 3 *X. cheopis* but 101 *Ctenocephalides* (*Ctenocephalus*) *felis strongylus*, Jord.,

which is commonly found on dogs but seldom on rodents. It thus appears that man is little concerned in the dissemination of infected *X. cheopis*, and enquiries into the circumstances associated with human plague revealed evidence, in the great majority of cases, of rodent mortality in the immediate neighbourhood, and none of the introduction of infection by visitors. Moreover, there was no suggestion of direct spread of infection from village to village, as might have been expected if the agency of man had been involved.

The hottest and driest month of the year is February and the coolest July. The incidence of plague rises in May, shows a decrease in July (corresponding to a marked decline in rainfall), rises to its maximum in August and falls gradually to its minimum in April. Thus a period of two months elapses between the time (March) when the temperature falls below 80°F. (and the active breeding of *X. cheopis* can take place [*cf. R.A.E.*, B, xv, 222]) and the rise in plague incidence. It may be assumed that during the first 3–4 weeks the multiplication of the flea is in progress, and that the rest of the time is occupied in the extension of the rodent epizootic, the infection of man and the incubation of the disease. Climatic conditions remain favourable for the propagation of *X. cheopis* until November, and it is suggested that the decline in the incidence of plague that begins in September may be due to the termination of the epizootic, possibly owing to the exhaustion of susceptible rodents. During dry weather, domestic rodents, particularly *M. coucha*, disperse to the fields in search of food, but during rainy weather they tend to remain in the huts and thus come into closer contact with man. The onset of the rains occurs in March, but it is probable that at this time the rodent population is not sufficiently infected for its movements to affect man. On the other hand, the temporary migration to the fields during the drier weather of June and July may account for the decline in human plague in July, and a similar migration may explain the lower incidence of plague from September onwards when rainfall also diminishes.

Ginning operations commence in February and continue until May or June, and the accumulation of cotton and cotton seed in and around the factories must lead to the concentration of enormous numbers of rodents at a time favourable for the propagation of *X. cheopis*. With the decrease in ginning operations in May and the redistribution of cotton seed to native growers in June, the large rodent population tends to disperse in search of food, with the consequent distribution of infected rats and fleas among the villages. A high incidence of plague would in any case be expected in the vicinity of ginneries, owing to the concentration of human population. The insanitary dwellings and total absence of adequate storage facilities for produce are conducive to close contact between man and domestic rodents. Thus it is questionable whether the construction and maintenance of rat-proof ginneries and cotton-buying stores would, in itself, lead to any appreciable diminution in plague incidence in rural endemic areas, particularly as it seems probable that field rodents may be concerned in transmission between villages. The development of the cotton industry has resulted in a corresponding extension of plague in cotton-producing areas, and as cotton production in Uganda has not yet reached its maximum output, the loss of life will be much greater in the future unless there is a progressive improvement in rural sanitation and in the standard of living of the native population.

Coles (J. D. W. A.). **Mortality in Fowls due to** *Aegyptianella pullorum.* — *Onderstepoort J.*, i, no. 1, pp. 9–14, 7 figs., 1 ref.

Bedford (G. A. H.) & Coles (J. D. W. A.). **The Transmission of** *Aegyptianella pullorum*, **Carpano, to Fowls by means of Ticks belonging to the Genus** *Argas.* — *T.c.*, pp. 15–18. Pretoria, July 1933.

In the first paper, an account is given of three outbreaks in the Transvaal of the disease of fowls caused by *Aegyptianella pullorum* [*cf. R.A.E.*, B, xxi, 107]. In the first case, there can be no reasonable doubt that high mortality among very young chicks was due to this disease. The brooder and shed in which the chicks were living were badly infested with *Argas persicus*, Oken, and 113 out of 200 died within 25 days of hatching and within 24 days of exposure to the ticks. The first deaths occurred 13 days after exposure, but mortality ceased 9 days after eradication of the ticks.

In the second paper, experiments are described in which chicks were subjected to the bites of *Argas persicus*, *Ornithodorus* (*A.*) *moubata*, Murr., and *O.* (*A.*) *péringueyi*, Bedford & Hewitt, that had previously fed on chicks and a fowl infected with strains of *Aegyptianella pullorum* in the above-mentioned outbreaks. The disease was successfully transmitted to 9 healthy chicks by adults of *A. persicus*, two chicks being infected in one case by the same tick. The incubation period in the chick varied from 12 to 15 days or more. An adult tick remained infected for 162 days. Four adults of *O. moubata* and 2 or 3 of *O. péringueyi* failed to transmit the disease, as did nymphs of *O. moubata* bred from a female fed on an infected chick. The factors affecting the virulence of *A. pullorum* are still obscure, but the age of the bird appears to be of some importance, the chicks 3–8 weeks old infected in the laboratory showing relatively slight symptoms.

Rivera Bandres (J.). **La leishmaniosis canina en Madrid y sus relaciones con la endemia de kala-azar infantil.**—*Med. Países cálidos*, vi, no. 5, pp. 373–398, 10 figs., 131 refs. Madrid, September 1933.

A number of cases of infantile kala-azar have occurred in Madrid since 1914, and of 450 dogs examined in 1933, 6·4 per cent. were infected with visceral leishmaniasis. The zones of greatest infection of infantile kala-azar and of canine leishmaniasis appeared to coincide. Of the infected dogs, 24 per cent. had cutaneous or cutaneo-mucous lesions, which are probably the most frequent source of infection of Arthropods [*cf. R.A.E.*, B, xxi, 219]. *Phlebotomus papatasii*, Scop., occurs in Madrid, and some examples of *Ctenocephalides canis*, Curt. (*Pulex serraticeps*, Gerv.) taken from infected dogs harboured *Leishmania* together with *Herpetomonas*. Leishman bodies were found in blood ingested by *Rhipicephalus sanguineus*, Latr., but no developmental forms indicative of an evolutional cycle.

Roubaud (E.). **Essai synthétique sur la vie du moustique commun** (*Culex pipiens*). **L'évolution humaine et les adaptations biologiques du moustique.**—*Ann. Sci. nat. Zool.*, (10) xvi, pp. 5–168, 8 pls., 32 figs., 5 pp. refs. Paris, 1933.

A very detailed account is given of the bionomics of the rural and urban races of *Culex pipiens*, L., occurring in France, which are here

named *C. pipiens pipiens* and *C. pipiens autogenicus* respectively. The information has been accumulated by the author during studies covering a period of more than 10 years, and much of it has already been noticed [*cf. R.A.E.*, B, xxi, 62 ; xx, 175 ; etc.]. During hibernation of the adults of the heterodynamic rural form, excretion takes place slowly and continuously, resulting in a state of "physiological purification" that brings about reactivation [*cf.* xi, 55]. Heat generally has an unfavourable influence on hibernating females and may even lead to the degeneration of the ovaries. The homodynamic urban race is characterised by a marked "hygrophilism," remaining as close as possible to water surfaces if placed in a dry atmosphere, and seldom leaving damp situations. In the heterodynamic rural form, this tendency is much less marked, except in hibernating females, in which the elaboration of the fat-body by means of "adipogenic autotrophism" can only take place in a damp atmosphere at comparatively low temperatures [*cf.* xx, 175]. The homodynamic race is stenogamic and the heterodynamic race eurygamic [*cf.* xx, 213], but the fact that the homodynamic autogenous females are readily fertilised by heterodynamic males, whereas homodynamic autogenous males were apparently unable to fertilise heterodynamic females in a confined space, suggests that eurygamy and stenogamy are qualities of the female rather than the male. In the progeny of autogenous females and heterodynamic males, the autogenous character is recessive [*cf.* xix, 24]. Both races are fundamentally ornithophilous, but the tendency to attack man becomes very marked in the progeny of crossings. In females of the autogenous race that had been kept under conditions of continuous autogenesis and were thus deprived of the particular reserves obtained from a blood meal, the tendency to attack man became more marked as the exhaustion of their protein resources became more manifest. In this strain, which was maintained for three years, the reproductive capacity of the females became more and more reduced and the relative number of them became gradually less until eventually only males were obtained.

In an addendum, the author points out that there are doubtless other races of this species, and describes a non-autogenous, stenogamic race from Algeria (here named *C. pipiens berbericus*) that breeds in the open and readily attacks man and animals. Unlike the other two races, it was easily maintained on a rabbit, and it also differed from the French rural form in that it was not heterodynamic and females paired readily with autogenous males in a confined space. Morphologically, it may correspond to the form with larvae having a slightly shorter siphon that has been recognised by Barraud in Palestine [ix, 99].

MARSHALL (J. F.) & STALEY (J.). **Variations in the Surface Pattern of Eggs of *Anopheles maculipennis* (Diptera, Culicidae) obtained in the South of England.**—*Stylops*, ii, pt. 10, pp. 238–240, 2 pls., 14 refs. London, 14th October 1933.

The authors record the presence in batches of eggs of *Anopheles maculipennis*, Mg., collected in a fresh water pool on Hayling Island or laid by females caught in nature, of barred and dappled eggs resembling illustrations of those of var. *messeae*, Falleroni, and var. *labranchiae*, Falleroni, respectively [*R.A.E.*, B, xxi, 177]. As, however, eggs of both types were found to be present in nearly every batch

examined, the problem of races in Britain would appear to be complicated. The float index [*cf.* xxi, 211] is said to be higher in the races with barred eggs than in those with dappled eggs, being in most cases greater or less than 0·4 respectively ; in the specimens examined the float index ranged from 0·28 to 0·50. The external claspette spine is stated to be always sharply pointed in males of the races with dappled eggs and to be blunt or slightly pointed in a certain proportion of those with barred eggs [xxi, 195]. In the hypopygia of 69 males from the area under consideration, some of which were reared and others collected as adults, the external claspette spine was found to be sharply pointed in 45 cases, slightly pointed in 22 and definitely blunt in 2.

GUNN (W. C.). **The Bed Bug** (*Cimex lectularius*). **Prevention of House Infestation. A Study for Public Health Purposes.**—[*Publ.*] *Dept. Hlth. Scotland*, no. 2, 20 pp., 8 pls. Edinburgh, H.M.S.O., 1933. Price 9*d*.

An account is given of the bionomics of *Cimex lectularius*, L., with descriptions of all stages. Methods for eradicating it that have been evolved as a result of experience in rehousing schemes undertaken in Glasgow are discussed. Although they have been very successful, instances of re-infestation of new houses have resulted from failure to maintain the necessary standard of cleanliness, or from an obscure breeding-place having been overlooked at the time of treatment.

To prevent the transference of bugs from old to new houses, reliance is placed chiefly on thorough scrubbing of all articles with soap, hot water and washing soda. In most cases it is necessary to explain and supervise the work. On the day of removal, the bedding is treated with steam at the disinfecting station and sent to the new house the same evening. The tenants are warned not to take with them infested, useless articles of furniture, and the danger of second-hand furniture as a source of infestation is explained. After removals, supervision is continued in case all bugs have not been destroyed. In an unoccupied house, if infestation has been found behind picture rails, skirting boards or badly hung wall-paper, these should be removed, all window frames, grates, etc., sealed with gummed paper and the house fumigated with sulphur dioxide, 3 or 4 cylinders each containing 20 fl. oz. liquefied SO_2 being used in each compartment of 1,000–1,200 cu. ft. capacity. Before fumigating, it has been found advantageous to spray with water (preferably with the addition of a little disinfectant), as the gas appears to be more effective if the atmosphere is damp. The door should be sealed and the house kept closed for 24 hours. When possible, fumigation should be repeated after 10 days in case any eggs that survived the first treatment have hatched. In most cases, however, eradication may be completed by cleaning immediately after fumigation. The picture rails and skirting boards should be scrubbed and the parts of the wall from which they were removed treated with a painter's blow-lamp. The ceilings should then be white-washed, the walls distempered, the rails and skirting boards replaced, and the floor scrubbed. When infestation is slight, it is possible to dispense with fumigation and rely entirely upon cleansing operations.

Occupied houses must be treated room by room, but the procedure is the same, except that the furniture and bedding must

also be disinfected as previously described. If sulphur is burned to produce the SO_2, the quantity recommended is 3 lb. per 1,000 cu. ft. In any case, permanent success depends more on cleaning than on fumigation. The effect of insecticide sprays is limited to the bugs and eggs with which they come into contact, and they do not effectively penetrate protected breeding-places. In houses constructed to prevent infestation, wooden picture rails and skirting boards have been abolished, and papering of the walls is discouraged. Old houses are usually more complicated in design and, moreover, the bugs may have penetrated into the structure of the walls. Persistent application of the measures described, together with the use of contact insecticides, may reduce the infestation, but in some cases nothing short of demolition will eliminate it.

THOMPSON (G. B.). **Association of Hippoboscids with Lice.**—*Nature*, cxxxii, no. 3337, pp. 605–606, 6 refs. London, 14th October 1933.

The author records the finding of 3 individuals of *Degeeriella marginalis*, Nitzsch, attached to the posterior portion of the abdomen of *Ornithomyia avicularia*, L., found on a song thrush in Hertfordshire, and of 11 individuals of the same louse attached in the same position on a museum specimen of *O. avicularia*, originally taken on a window in Surrey. Similar observations are briefly reviewed from the literature [*cf. R.A.E.*, B, xv, 208 ; xvi, 234].

AUBERTIN (D.). **Revision of the Genus *Lucilia* R.-D. (Diptera, Calliphoridae).**—*J. Linn. Soc. Lond.*, (Zool.) xxxviii, no. 260, pp. 389–436, 30 figs., 2 pp. refs. London, 7th November 1933.

This revision of the genus *Lucilia* is based on an examination of material from all over the world and so far as possible of the original types ; 27 species (of which one is new) and two varieties are recognised, 82 names being listed as synonyms. The geographical distribution of the various species is indicated, and a key to them is given. A list of the names that have been erroneously referred to the genus, together with any relevant information, is appended, in which attempts are made to include both new and established synonymy.

Index Veterinarius.—4to, xxxvi+304 pp. multigraph. Weybridge, Imperial Bureau of Animal Health, April 1933. Annual subscription £4.

This combined author and subject index of the veterinary literature indexed during the first quarter of 1933 contains references to numerous articles of entomological interest. Full titles of articles are given only under the author (or first author if there are several) or, in the case of anonymous articles, in a separate list arranged by subjects ; otherwise a condensed version in English is used. References are made under countries, animals, vectors and causal organisms of disease, etc., *e.g.* in Taylor (A. W.). " Pupal parasitism in *Glossina morsitans* and *G. tachinoides* at Gadau, Northern Nigeria." [*R.A.E.*, B, xxi, 53] entries occur under " Taylor, A. W." " Pupal Parasitism," " Parasitic Infestation—General," " Glossina " and " Nigeria." Headings under which there are many references are divided and subdivided. The index is preceded by a list of the abbreviations used for the titles of the journals referred to.

NIGAM (L. N.). **The Life-history of the Common Cockroach** (*Periplaneta americana* **Linneus**).—*Indian J. Agric. Sci.*, iii, pt. 3, pp. 530–543, 4 pls., 12 refs. Calcutta, June 1933.

A detailed account is given of the bionomics of *Periplaneta americana*, L., as observed under insectary conditions at Pusa. In India, this cockroach is ubiquitous and omnivorous, infesting store-rooms, kitchens and libraries, and attacking clothes, hair, boots, paper, books, fruits, and particularly sweetened and starchy foods. Both nymphs and adults are attracted by warmth, moisture and darkness and can live for several days without food. The egg-pods, which are laid from April–May throughout the summer months but very rarely in November–March, are generally covered with pieces of any available material, those left exposed being usually devoured by other cockroaches or by the parent female. The number laid by a single female, in observations lasting from September to June, was usually 10–15 ; in nature, it is probably much higher [*cf.* *R.A.E.*, B, xxi, 251]. The average interval between ovipositions is 4–5 days when the females have ample opportunities for pairing. There are normally 16 eggs in a pod. The female matures 1–2 weeks after the last moult and usually begins to oviposit 3–7 days after pairing. The eggs hatch in 27–28 days and, after a varying number of moults, the nymphs reach maturity in 10–21 months. When deprived of food, they will devour their own kind, and they have been recorded as preying on termites and bed-bugs [*Cimex*]. The literature dealing with the pathogenic and other organisms that have been found in cockroaches is briefly reviewed.

KRIJGSMAN (B. J.) & WINDRED (G. L.). **Investigations on the Buffalo Fly** *Lyperosia exigua* **de Meij.**—*Pamph. Coun. Sci. Industr. Res. Aust.*, no. 43, 40 pp., 7 figs., 46 refs. Melbourne, 1933.

This pamphlet gives the results of some of the investigations carried out in Java on the bionomics of *Lyperosia exigua*, de Meij., much of the information having already been noticed [*R.A.E.*, B, xx, 134, 258 ; xxi, 257, etc.]. It was found that the larvae prefer fresh buffalo dung, but are able to survive in dung 5 days old. They could also mature in the excrement of cows, horses, pigs, rabbits, guineapigs and wallabies, provided that the moisture content was suitable. Vegetable matter in all states of decomposition proved unsuitable, and experiments with dung-inhabiting bacteria, which it was thought might possibly form the ultimate food of the larvae, also gave negative results. These results, together with others [xix, 22] recorded briefly in this paper, suggest that *L. exigua* is unlikely to become established in any area where there are no cattle or buffaloes ; although the adults have not been observed to feed on pigs, the fact that the larvae thrive on pigs' dung in its normal state indicates that the fly might become established in areas where pigs occur. Field observations showed that there is a close correlation between the abundance of the fly and the amount of rainfall [*cf.* xx, 46]. Swampy conditions, if the rainfall is not excessive, favour development. The larvae are most easily influenced by climatic conditions, particularly rainfall, preferring a degree of moisture in dung similar to that in freshly dropped material. In very wet dung, however, they develop more slowly, and if a drier situation is not found for pupation [*cf.* xx, 258], they often die. With artificial rainfall, the number of puparia formed

increased inversely as the rainfall, provided that evaporation was not too great. The scarcity of *L. exigua* in Java is thus due primarily to the high rainfall over the greater part of the island.

SOERONO [M.]. **Intermittierende Behandlung mit kleinen Plasmochindosen bei Malaria.** [Intermittent Treatment of Malaria with small Doses of Plasmochin.]—Dissert. Batavia, 1932. (Abstr. in *Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 10, pp. 466–467. Leipzig, October 1933.)

SOESILO (R.) and others. **Malariabestrijding (Jaarverslag van het Geneeskundig Laboratorium over 1932).** [Malaria Control (Annual Report of the Medical Laboratory).]—*Meded. Dienst Volksgezondh. Ned.-Ind.*, xxii, no. 2, pp. 99–120, 1 fig., 7 refs. Batavia, 1933.

The second paper includes a more detailed account than is given in the abstract under the first title of the effect of plasmochin treatment of gametocyte carriers on the infection of Anophelines [*R.A.E.*, B, xvii, 246]. In an isolated coastal district of West Bantam, Java, where malaria is endemic and *Anopheles sundaicus*, Rdnw. (*ludlowi*, auct.) is the chief vector, plasmochin treatment from November 1931 to January 1932 was applied to the whole population in three villages, a fourth being left as a control. The infection indices of *A. sundaicus* during treatment and in March and June 1932 respectively were: 0·21, 0 and 0 in a village where 40 mg. was given every 4th day for 9 weeks, with the addition of 1·2 gm. quinine hydrochloride daily for a week followed by 0·6 gm. daily for a fortnight; 0·23, 0 and 0 for a village where the same doses of plasmochin were given without quinine; 1·08, 0 and 1·31 for a village where 20 mg. of plasmochin was given with the addition of 1·2 gm. quinine daily for a week followed by 0·6 gm. daily for five weeks; and 5·18, 4·59 and 1·42 in the control village.

Investigations were made in two districts of Sumatra, where malaria had occurred among immigrants from Java. In one, larvae of *Anopheles hyrcanus*, Pall., and *A. aconitus*, Dön., were found in March 1932 in pools in rice-fields after the harvest, in irrigation channels and in swampy depressions. The latter is a very dangerous vector in Java and has caused epidemics in Sumatra. In July, malaria parasites were found in 1 female of 6 of *A. hyrcanus* var. *sinensis*, Wied., 4 of 163 of *A. hyrcanus* var. *nigerrimus*, Giles, and 1 of 82 of *A. aconitus*, all of which last were taken in houses. In the other district, *A. hyrcanus* var. *sinensis* was the chief vector, breeding in rice-fields, channels and fish-ponds. The larvae were protected from *Haplochilus panchax* [*cf.* xix, 170; xx, 218], which had been imported from Java, by aquatic plants, but it was found that these could be cleared by another fish, *Puntius javanicus*, which should be protected from hot sunshine by raising the height of the dyke round a pond and digging a channel along the edge of it. *P. javanicus* should be introduced about a month after *H. panchax*. As, however, larvae of *A. hyrcanus* were found elsewhere than in the ponds, a complete drainage scheme is required.

Analysis of the water of Anopheline breeding-places showed that in all the saline-ammonia content was less than 1 part per million [*cf.* xiv, 34]. *A. aconitus* was found in water with a low content of organic matter [xx, 198]. In only 2 out of 17 Anopheline breeding-places was the proportion of oxidised to ammoniacal nitrogen less

than 1 : 1. *A. aconitus* occurred in both these, though not in abundance. In East Java, larvae of this mosquito have been recorded as abundant in water with a pH of 8·3 ; in the 14 breeding-places examined during the year under review, the pH appeared to vary between 6·6 and 7·6. The larvae were found in sunny or not too heavily shaded water [xix, 102].

CILENTO (R. W.). **Australia's Problems in the Tropics.**—*Rep. Aust. Ass. Adv. Sci.*, xxi (1932), pp. 216–233. Sydney, 1933.

In Australia, malaria is confined to the Northern Territory, where it occurs along the rivers running into the Timor Sea and the Gulf of Carpentaria, and to two areas in north Queensland. Except at Cairns, in Queensland, it is almost entirely restricted to people living under very primitive conditions. On the other hand, the distribution of Anophelines throughout Australia is relatively heavy and general [*R.A.E.*, B, xviii, 135], and it is fortunate that there is no suitable native population to act as a reservoir of the malaria parasites. Although the disease has sunk to comparative insignificance, the situation may be materially altered by any unexpected concentration of population in the endemic areas. Moreover, a constant risk is involved in the increasing numbers of persons returning every year from the Territories of Papua and New Guinea, where, among a resident white population of several thousands, almost all acquire the disease.

Brief notes are also given on the distribution and mosquito vectors of filariasis in Australia [*cf.* xvi, 93 ; xx, 18].

[BORZENKOV (A. K.) & DONSKOV (G. D.).] **Борзенков (А. К.) и Донсков (Г. Д.). The Experimental Infection of the Tick** *Hyalomma volgense* **P. Schultze et E. Schlottke, 1929, with Plague.** [*In Russian.*]—*Rev. Microbiol.*, xii, no. 1, pp. 25–30. Saratov, 1933. (With a Summary in English.)

In view of the possible relation of ticks to plague [*cf. R.A.E.*, B, xviii, 270 ; xxi, 160 ; etc.], experiments were carried out in Stalingrad with *Hyalomma volgense*, Sch. & Schl., which is very common in the district on cattle in spring. When adult ticks were fed on artificially infected laboratory animals, chiefly ground squirrels (*Citellus pygmaeus*), virulent plague bacilli were present in emulsions prepared from their faeces or digestive tracts up to the 11th day. Furthermore, adult ticks transmitted the infection to healthy ground squirrels, apparently by biting, as indicated by an experiment in which it was impossible for the animal to eat the ticks placed on it, or to rub them or their faeces into the skin. Engorged nymphs and larvae harboured plague bacilli for up to 3 and 7 days respectively, and a positive plague culture was also obtained from the faeces of infected nymphs.

[ZASUKHIN (D. N.).] **Засухин (Д. Н.). Summary of Work on Tick Investigations in the South-East of USSR.** [*In Russian.*]—*Rev. Microbiol.*, xii, no. 1, pp. 31–46, 3 figs., 2 pls., 41 refs. Saratov, 1933. (With a Summary in English.)

A list is given of the 13 species of ticks found in 1929–33 in the Lower Volga Region and Western Kazakstan, showing their local distribution and hosts. Species of frequent occurrence were *Dermacentor silvarum*,

Olen., *D. niveus*, Neum., *Rhipicephalus schulzei*, Olen., *Argas persicus*, Oken, and *Hyalomma uralense*, Sch. & Schl., with which the author considers *H. volgense*, Sch. & Schl., to be identical [the latter apparently having page priority]. Less common species were *Ixodes laguri*, Olen., *I. ricinus*, L., *Haemaphysalis cinnabarina punctata*, C. & F., *H. numidiana*, Neum., *R. bursa*, C. & F., *R. sanguineus*, Latr., a subspecies of *Hyalomma marginatum*, Koch, and an undescribed species of *Ornithodorus*. The areas investigated are divided into the black-soil steppe zone, the dry steppe, and the semi-desert, and the distribution of the different species in these zones is shown in a table.

The bionomics of *D. silvarum* in the Lower Volga Region are very similar to those recorded from western Kazakstan, where it was erroneously identified as *D. niveus*, Neum [*R.A.E.*, B, xx, 103]. The adults are especially abundant on cattle and horses from mid-April to early June ; engorged females drop to the ground from mid-May onwards, whereas males remain on the animals longer (occasionally as late as August).

Nymphs of *H. uralense* are numerous on cattle in both areas from November till January, and adults from January–February till May ; the latter begin to drop off the hosts in April. Horses are occasionally infested. Oviposition occurs at the end of June, and the larvae hatch early in August. The author succeeded in inducing the larvae to feed on a calf, but they were not found under natural conditions. It is possible that the whole life-cycle is completed on a single host, the larvae attaching themselves in autumn, but not being visible in the thick hair. In the Lower Volga Region, *H. uralense* is more abundant in the south, where it attacks a wider range of hosts ; in the south-western part, it also occurs on camels [*cf.* xxi, 61]. In some localities, the average number of adults and nymphs on a cow was as high as 550. The yield of milk from infected cows is greatly reduced, growth is retarded, the animals lose weight, and the hide and hair are damaged. One female can extract 4 cc. of blood.

In the Lower Volga Region, *D. silvarum* probably transmits various forms of equine piroplasmosis [xx, 104 ; xxi, 60] as well as *Piroplasma canis* of dogs and, in the larval or nymphal stage, *Nuttallia ninense* of hedgehogs. The adults may possibly transmit plague [xx, 104] ; nymphs taken from an artificially infected hamster (*Cricetus cricetus*) in Western Kazakstan in 1930 preserved virulent plague bacilli for 35 days, and similar results were obtained with larvae and adults.

Argas persicus transmits spirochaetosis of poultry, which is very common in south-eastern Russia, and *R. schulzei* preserves plague bacilli [xviii, 270] and is the vector of *Piroplasma kolzovi*, which causes epizootics among ground squirrels [xx, 42].

ALBANESE (A. A.). **The Hydrogen-ion Concentration as a Factor concerned in the Breeding of Mosquito Larvae.**—*Arb. ung. biol. Forsch. Inst.*, v, pp. 168–176, 2 figs., 4 refs. Tihany, 1932. (With a Summary in Magyar.)

Samples of water were taken from each of 82 barrels near Lake Balaton, Hungary. Larvae of *Anopheles maculipennis*, Mg., and *Culex pipiens*, L., occurred together in 8, *C. pipiens* alone in 50, and no larvae in 24. *A. maculipennis* occurred at a pH range of 7·92–8·42, and *C. pipiens* at one of 6·42–9·01, which was a greater variation than

that of the samples containing no larvae. The range preferred by this mosquito, however, is probably more restricted, as 90 per cent. of the larvae occurred at pH 7·90–8·55.

LÖRINCZ (F.) & SZENTKIRÁLYI (Z.). **Ueber das Vorkommen von *Phlebotomus macedonicus* (Adler und Theodor, 1931) in Ungarn. (Untersuchungen über Hunde-Kala-azar.)** [On the Occurrence of *P. macedonicus* in Hungary. (Investigations on Canine Kala-azar.)]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 10, pp. 458–464, 7 figs., 4 refs. Leipzig, October 1933.

In August 1931, cases of a peculiar dermatitis occurred near Szeged, in Hungary, where *Phlebotomus macedonicus*, Adl. & Thdr., was the only sandfly found. In 1932, this species was again observed in August. It was taken only in dwellings, being most abundant between 9 and 11 p.m. and disappearing after midnight. The daily appearance of the females was followed by that of the males, the former being 8–10 times as numerous. The adults of both sexes are described. Up to the present, no native cases of human leishmaniasis have been recorded in Hungary, and no Leishman bodies were found in 80 dogs examined in 1932.

POPOW (P. P.) & GOLZOWA (R. D.). **Zur Kenntnis der Wasserstoffionenkonzentration im Darmkanale einiger blutsaugender Arthropoden.** [A Contribution to the Knowledge of the Hydrogen-ion Concentration in the Intestinal Tract of some Blood-sucking Arthropods.]—*Arch. Schiffs- u. Tropenhyg.*, xxxvii, no. 10, pp. 465–466. Leipzig, October 1933.

In view of the high specificity shown by different species of Arthropods as intermediate or definitive hosts of Protozoa, worms, or spirochaetes, the authors record the results of an investigation of the pH values of the digestive tracts of *Culex pipiens*, L., *Anopheles maculipennis*, Mg., *Cimex lectularius*, L., *Ornithodorus lahorensis*, Neum., *Pediculus humanus*, L. (*vestimenti*, Nitzsch) and *Periplaneta* (*Blatta*) *americana*, L.

KLEIN (F.). **Beitrag zur Kenntnis der Staubwanze (*Reduvius personatus* L.).** [Contribution to the Knowledge of *R. personatus*.]—*Ber. oberhess. Ges. Natur- u. Heilk.*, (N.F.) xv, pp. 103–107, 14 refs. Giessen, 1933.

The pairing of *Reduvius personatus*, L., is described. The nymphs, even when only 14 days old, killed and sucked out both nymphs and adults of *Cimex lectularius*, L., choosing these in preference to *Lepisma saccharina*, L., or larvae of *Anthrenus scrophulariae*, L.

MISSIROLI (A.). **Tipo epidemico delle febbri malariche nel Nord d'Italia.** [The Epidemic Type of the Malarial Fevers in North Italy.]—*Riv. Malariol.*, xii, fasc. 4, pp. 675–688, 4 graphs, 4 refs. Rome, 1933. (With Summaries in Italian p. 832, French p. 834, English p. 836, German p. 838.)

In a study of the character of the epidemic type of malaria prevalent in North Italy, it was found that the incidence of benign tertian shows a slight temporary rise in spring and a marked one in late summer and

autumn. It predominates over malignant tertian, which also occurs in late summer and autumn, but tends to disappear in spring. During this work, investigations on the races of *Anopheles maculipennis*, Mg., in that region [*cf. R.A.E.*, B, xxi, 177] were continued, ten collecting stations being established near Portogruaro, Venetia, in an area extending about 12 miles towards the Adriatic, with abundant fresh and salt water and some stretches of ground below sea-level. Anopheline density rose in June, reached its peak in July and fell slowly in August, September and October, whereas in Central Italy and Sardinia it rises in May, reaches its peak in June and July and falls rapidly in August. Comparison of the mean temperatures in Venetia and Latium during May and June revealed differences too slight to explain this divergence in the development curves, and it is suggested that it is related to the races of *A. maculipennis* concerned. At Posada (Sardinia), *A. maculipennis* var. *labranchiae*, Falleroni, predominates, whereas at Portogruaro *A. maculipennis maculipennis* and *A. maculipennis* var. *messeae*, Falleroni, predominate, and these, owing to the winter ovarian inertia, begin to oviposit at a later date than *labranchiae*. *A. sacharovi*, Favr (*maculipennis* var. *elutus*, Edw.) was found everywhere in the Portogruaro zone. This mosquito, which bites man in almost any environment and is responsible for the presence in this zone of malignant tertian, hibernates in animal quarters and infects man in summer.

CARDAMATIS (J. P.). **Relation entre les conditions météoriques et le paludisme en Grèce.**—*Riv. Malariol.*, xii, fasc. 4, pp. 689–700. Rome, 1933. (With Summaries in Italian p. 832, French p. 700, English p. 836, German p. 839.)

Over most of Greece in 1932, Anophelines and other mosquitos were much less numerous than usual. Though in Athens drainage work and the provision of a piped water supply undoubtedly played a part in this diminution, they were not material factors. An examination of meteorological data obtained in Athens in 1931 and 1932 and in the country in 1932 showed that each summer was characterised by high temperature, low atmospheric humidity and a period without rain. It is considered that these conditions were a definite factor in reducing mosquito abundance.

TILLI (P.). **Disanofelizzazione idrica mediante la calciocianamide.** [The Control of Anopheline Larvae by Calcium Cyanamide.]—*Riv. Malariol.*, xii, fasc. 4, pp. 722–730. Rome, 1933. (With Summaries in Italian p. 730, French p. 835, English p. 838, German p. 840.)

In experiments with chemical fertilisers as possible Anopheline larvicides, superphosphates and potassium sulphate proved ineffective, and ammonium nitrate, sodium nitrate and ammonium sulphate were only larvicidal in 8 per cent. solutions. Calcium cyanamide and its derivatives, however, killed the larvae when applied as dusts on the surface of the water, though their action was much less rapid than that of oil or Paris green. In experiments in which female mosquitos were allowed the opportunity of ovipositing either in untreated water or in water covered with road dust, alone or mixed with Paris green or calcium cyanamide, the water with plain road dust was preferred and

that with calcium cyanamide was the least attractive. The eggs laid in it, however, did not hatch, whereas nearly all those in the other waters did. In field tests, a mixture of 1 lb. calcium cyanamide and 13 lb. road dust was found sufficient to cover about 1,200 sq. ft. of water surface. Weekly applications kept the water free from larvae, but reinfestation occurred when 19 days elapsed without dusting.

Combiesco (D.) & Popesco (C.). **Absence du typhus exanthématique murin en Roumanie.**—*C. R. Soc. Biol.*, cxiv, no. 30, pp. 317–318, 4 refs. Paris, 1933.

In view of the fact that, since the War, typhus has survived in an almost endemic form in Rumania, particularly Bessarabia, and of the discovery of the virus in rats at Athens [*R.A.E.*, B, xx, 101], attempts were made to recover it from 100 rats, *Mus rattus alexandrinus* and *M. norvegicus* (*decumanus*), from Bucarest and Constanza by inoculation into guineapigs of suspensions of their brains or of lice [*Polyplax spinulosa*, Burm.] or fleas, chiefly *Xenopsylla cheopis*, Roths., found on them. Negative results were obtained in all cases.

Monteiro (J. Lemos). **Résultat de l'épreuve d'immunité croisée entre le typhus exanthématique de São Paulo et la fièvre pourprée des Montagnes rocheuses.**—*C. R. Soc. Biol.*, cxiv, no. 30, pp. 374–376, 3 refs. Paris, 1933.

From his own experiments in Brazil, in which guineapigs immunised or vaccinated against São Paulo exanthematic typhus showed no reaction when inoculated with the virus of Rocky Mountain spotted fever (obtained from infected individuals of *Dermacentor venustus*, Banks (*andersoni*, Stiles) sent from the United States) and from those of workers in the United States [*cf. R.A.E.*, B, xxi, 262, etc.], the author concludes that the former disease belongs to the same group as the latter.

de Beaurepaire Aragão (H.). **Transmission de la fièvre jaune par les tiques.**—*C. R. Soc. Biol.*, cxiv, no. 29, pp. 137–139, 1 ref. Paris, 1933.

The following transmission experiments, all of which produced fatal infections with yellow fever, were carried out in Brazil with *Macacus rhesus* and *Amblyomma cayennense*, F. : Blood taken from an infected monkey was injected into 15 female ticks, and an emulsion made from them injected into a healthy monkey ; 2 nymphs and 6 females were fed on a healthy monkey after partial engorgement on an infected one; and 3 monkeys received respectively injections of emulsions of female ticks 7 and 14 days after they had been removed from an infected monkey, and of eggs laid 8 days after removal by one of these females and emulsified 11 days later. Infection was also produced when six examples of *Ornithodorus rostratus*, Arag., partly engorged on an infected monkey, were placed 4 days later on a healthy one, but other experiments in which the interval was longer gave negative results, both with this tick and with *O. moubata*, Murr., and whether attempted infection was by biting or by injection. It thus appears that these ticks do not preserve the virus so long or transmit it so readily as does *A. cayennense.*

EWING (H. E.). **Three new Chigger Mites of the Genus *Trombicula* from Panama, with a Key to the known Adults of *Trombicula* of the New World.**—*Proc. U.S. Nat. Mus.*, lxxxii, Art. 29, no. 2970, 6 pp., 3 figs. Washington, D.C., 1933.

Two of these new species are described from adults taken on the walls of caves and the third, *Trombicula hominis*, from larvae taken from the ear and scalp of a child.

GIBSON (A.). Ed. **Entomological Research Projects in Progress in the Dominion of Canada 1933.**—Multigraph 154+7 pp. Ottawa, Res. Comm. Canad. Soc. Tech. Agric., 1933.

This annotated list of projects includes sections concerned with household pests, and with insects and other external parasites affecting man and livestock. Author and subject indices are included.

ADAMS (A. R. D.) & LIONNET (F. E.). **An Outbreak of Surra among the wild Deer** (*Cervus unicolor* **var.**) **of Mauritius.**—*J. Comp. Path.*, xlvi, pt. 3, pp. 165–167, 2 refs. Croydon, September 1933.

Investigation of an outbreak of disease among deer (*Cervus unicolor*) in Mauritius revealed the presence in the blood of a monomorphic trypanosome indistinguishable from *Trypanosoma evansi*. *Stomoxys nigra*, Macq., the vector of surra among domestic animals [*R.A.E.*, B, xvii, 20], is abundant in the forest, particularly during the hotter months (October–March), and causes considerable annoyance to all the larger mammals. A cart track runs through the infected estate and across a clearing where the animals congregate to feed, and it is suggested that the disease was introduced by transference of the trypanosome from an infected draught ox to a stag by this fly.

MORRIS (J. P. A.). **Disease Control.**—*Ann. Rep. Dept. Anim. Hlth. N. Rhod. 1932*, pp. 14–24. Livingstone, 1933.

Field observations in Northern Rhodesia in 1932 indicated that once trypanosomiasis has been introduced into a herd of cattle in an area uninfested with *Glossina*, it is spread by other flies, such as *Stomoxys*, Tabanids and Hippoboscids.

Ectoparasites of cattle include *Demodex bovis*, Stiles, which is prevalent, though the lesions are not always large and pustular, and *Psoroptes bovis*, Gerl., which is common, especially in the cold months, and usually attacks animals in a weakened condition, primarily at the withers and the base of the tail. Myiasis caused by species of *Lucilia*, *Chrysomyia* and *Auchmeromyia* is of frequent occurrence, and the maggots usually require surgical removal. *Ornithodorus* (*Argas*) *megnini*, Dug., was observed on imported cattle. Horses are attacked by *Amblyomma variegatum*, F., the bites of which cause abcesses and sometimes produce the so-called "tick pyaemia"; sheep by various ticks, including *Ixodes pilosus*, Koch, though tick paralysis has not been observed, and by *Linognathus stenopsis*, Burm. (*africanus*, Kellogg & Paine) and *L. pedalis*, Osb., which occur on the body and feet respectively; dogs by *Haemaphysalis leachi*, Aud.; and fowls by *Echidnophaga gallinacea*, Westw.

Duke (H. L.). **Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. IV. On the spontaneous Disappearance of Flagellates from an infected** *Glossina*.—*Ann. Trop. Med. Parasit.*, xxvii, no. 3, pp. 431–435, 3 refs. **V. On the Effects of Temperature.**—*T.c.*, pp. 437–450, 8 refs. **VI. On the Duration of the Biological Cycle in** *Glossina*.—*T.c.*, pp. 451–467, 8 refs. Liverpool, 21st October 1933.

The author points out that the experience of investigators over many years has, on the whole, confirmed Kleine's original contention that a tsetse-fly is not infective until the salivary glands are invaded by the trypanosome. Workers in Uganda have failed to confirm the observation of Yorke and his colleagues in Rhodesia that forms infective to mammals are present in the intestine of the fly [*R.A.E.*, B, i, 170], and suggest that infection obtained on injection of flagellates contained in the fly's intestine was due to leakage or more probably to the swallowing of gland forms by the living fly, an explanation that is supported by the fact that all Yorke's experiments were performed with flies that also had infected glands. Experience indicates also that under normal circumstances, when a fly has acquired infection of both gut and salivary gland with a trypanosome of the polymorphic group, the flagellates will persist in both situations throughout the life of the fly. The author, however, describes an observation made with *Trypanosoma gambiense* and *Glossina palpalis*, R.-D., that apparently supports Bruce's conclusion that flagellates may disappear spontaneously from the gut and salivary glands.

In the second paper, after reviewing previous work on the effect of temperature on the infection rate of trypanosomes in *Glossina*, the author points out that although Taylor's experiments with *T. gambiense* in *G. tachinoides*, Westw. [xx, 275] prove that higher temperatures favour the development of the parasite, no account was apparently taken of the fact that variations in the infection rate of the incubated and non-incubated flies might have been partly due to differences in the stage of the endogenous cycle of the trypanosome in the vertebrate host imbibed by the fly, since there is no indication that the two batches were fed simultaneously. Moreover, the possibility that differences in transmissibility might be due to differences in the length of sojourn of the trypanosome in the vertebrate host also seems to have been disregarded. The author describes similar experiments, undertaken at Entebbe with *T. gambiense*, *T. rhodesiense* and *T. brucei*, in which these objections were obviated by feeding two batches of flies (*G. palpalis*) immediately after one another on the same infecting animal and maintaining one lot at room temperature and the other in the incubator. In the first series of experiments, the incubator temperature was 86–88°F., and in the second, 96–98°F. Examination of the figures showed that a higher rate found in incubated flies in the first series might have been fortuitous, but that in the second series it was probably due to temperature. Taylor concludes that the increased infection rate in incubated flies is due to the beneficial effect of the high temperature on the trypanosome, helping it in its early efforts at multiplication and establishment in the fly. Prolonged retention of the flies in the incubator after the period of infecting feeding was found to produce no further effect. After comparing his results with Taylor's, the author considers that this interpretation alone is inadequate, and that the influence of the higher temperature on the fly itself must be

taken into account. If the higher temperature acted solely or even mainly on the trypanosome, the difference between the incubated and non-incubated samples in the Entebbe series should be greater (to correspond with those in Nigeria), as there is no reason to suppose that there is any fundamental difference between representative series of strains of *T. gambiense* from Nigeria and Uganda in their response to changes of temperature. If, on the other hand, the higher temperature affects the physiological processes of the fly in some way favourable to the trypanosome, then the difference between the two sets of experiments is more easily intelligible. For a tsetse to transmit to the limit of its capacity, it is probable that it must enjoy its optimum temperature. *G. palpalis* on Lake Victoria never experiences the extremes of climate to which *G. tachinoides* is accustomed in Nigeria, and in the latter species a temperature of 98·6°F. (which is well within the range experienced in nature) brings out to the full its latent ability to transmit the trypanosome.

In the third paper, the author discusses the methods used to determine the length of the life-cycle of the trypanosome in the fly and reviews the work that has been done on this subject in various parts of Africa with various trypanosomes and different species of *Glossina*, the experiments carried out at Entebbe since 1926 being summarised in a table. He concludes that it is quite exceptional for trypanosomes affecting man to require more than 30 days to reach the salivary glands; as a rule, 25 or less are sufficient [*cf.* xvii, 40]. In the second part of the paper, he collects from various sources records of infected flies that lived longer than the average time required by the strain with which they were infected to complete its life-cycle and yet had no flagellates in their salivary glands. From these, he concludes that, with the majority of East African strains of *T. gambiense*, there will always be a certain number of individual infected flies in which trypanosomes never reach the salivary glands, no matter how long the flies live after their infecting feed.

Shute (P. G.). **A simple Method of obtaining Eggs of Mosquitoes.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 3, pp. 469–470, 3 refs. Liverpool, 21st October 1933.

The procedure described, which has been evolved to avoid the delay often experienced in obtaining eggs from mosquitos by the usual method, has been used with success to induce immediate oviposition in various species of *Anopheles*, *Aëdes* and *Mansonia* (*Taeniorhynchus*). A gravid female is placed in a strong test-tube plugged with cotton-wool and shaken to the bottom, which is then tapped sharply 7 or 8 times against the lower part of the hand. The stunned female is then dropped into a watch-glass of water, which is covered with a piece of glass. Within a few minutes, the mosquito partly recovers and begins to oviposit, an egg being laid every 10–15 seconds until 200 or more are lying on the surface of the water. Among mosquitos transported by air mail from abroad in Barraud's cages [*cf. R.A.E.*, B, xvii, 255], there are usually some gravid females with their wings so damaged that they cannot fly; in such cases, the same procedure may be used without the preliminary stunning.

CHRISTOPHERS (Sir S. R.). **Family Culicidae. Tribe Anophelini.**—*Fauna Brit. India, Dipt.* iv, Med. 8vo, xii+371 pp., 3 pls., 53 figs., 29 pp. refs. London, Taylor & Francis, October 1933. Price 22*s.* 6*d.*

This detailed and comprehensive work is primarily divided into four parts "General" (pp. 1–80), "Keys" (pp. 81–94), "Systematic" (pp. 95–315) and "Bibliography" (pp. 316–344). The first part comprises an outline of the characteristics of the species of the tribe ANOPHELINI and of their classification, with descriptions of the characters of all the stages used in identification; a discussion of their geographical distribution, including a tabular statement of the species and varieties of the Indian area grouped according to their geographical affinities; a brief general account of their bionomics, with a list of the chief types of breeding-places in the Indian area and the species most commonly found in them; data regarding the part played by the various species in the transmission of malaria (the information being taken from papers by Covell [*R.A.E.*, B, xvi, 41; xix, 163]); and details of the technique for collecting, rearing, preserving and examining specimens. The second part consists of keys to the adults, larvae and eggs of the species recorded from the Indian area, the larval key being based on that of Puri [xix, 72]. In the third part, all the known stages of the species and varieties recorded from the Indian area are described (some of them for the first time), with notes on the synonymy, distribution, bionomics and malaria-transmitting ability of the species, and keys to the genera of the ANOPHELINI and to the subdivisions of *Anopheles*. Covell's summary by districts of the distribution of species in India [xx, 121] is given as an appendix.

The author differs from views on synonymy already noticed [xxi, 1] in that he gives specific rank to *Anopheles barianensis*, James, and varietal status to *A. lindesayi* var. *pleccau*, Koidz. (which is not, however, recorded from the Indian area), *A. jeyporiensis* var. *candidiensis*, Koidz. (*tonkinensis*, Toumanoff [*cf.* xx, 62]) and *A. maculatus* var. *willmori*, James. He also considers *A. pseudobarbirostris*, Ludl. [xv, 61] and *A. pinjaurensis*, Barraud [xxi, 96] to be distinct species, *A. subpictus* vars. *indefinitus*, Ludl., and *malayensis*, Hacker (which do not occur in the Indian area) to be distinct varieties [*cf.* xx, 93], and *A. annandalei* var. *djadjasanensis*, Brug [xv, 52] to be inseparable from the typical *A. annandalei*, Prashad [*cf.* xviii, 75, 141].

WALLACE (R. B.). **Further Field Experiments with Plasmochin in Oiled and Unoiled Areas.**—*Malayan Med. J.*, viii, no. 3, pp. 145–162, 6 charts, 8 refs. Singapore, September 1933.

Experiments on the treatment of all labourers on an unoiled and certain oiled areas of a rubber estate in Malaya with plasmochin were carried out during the malarial season from April to September 1932. The malaria rate remained low on all experimental divisions and was lower than on the control oiled division. Although the results indicate that the other treatments were of value, definite conclusions appear to be justifiable only in the case of the unoiled area, where a daily dose of 0·02 gm. plasmochin simplex appeared to be successful in preventing malaria in a labour force of approximately 330 during the period of treatment, in spite of the abundance of breeding-places of *Anopheles maculatus*, Theo., the chief vector of malaria in inland hilly estates.

BARROWMAN (B.). **Chemotherapy in Anti-malarial Sanitation.**—*Malayan Med. J.*, viii, no. 3, pp. 163–175, 4 charts, 1 ref. Singapore, September 1933.

An account is given of experiments carried out in Malaya to determine the relative value and costs of various new drugs (plasmochin, atebrin and tebetren) in the treatment of malaria. The fact that they act more rapidly than quinine, thus reducing the chances of Anophelines obtaining infected blood, suggested that sterilisation of a population by their use might be substituted for the usual anti-mosquito measures, but the experiments indicated that no chemical method of prophylaxis at present available, whether applied as mass treatment or as treatment of carriers, is an effective alternative in a population exceeding 80 persons in countries such as Malaya, where malaria is potentially hyperendemic throughout the year.

GATER (B. A. R.). **Notes on Malayan Mosquitoes, IV. Anopheline Larvae of the** *umbrosus* **Group.**—*Malayan Med. J.*, viii, no. 3, pp. 180–189, 23 figs., 25 refs. Singapore, September 1933.

Descriptions (with a key) are given of the larvae of *Anopheles umbrosus*, Theo., *A. brevipalpis*, Roper, *A. hunteri*, Strickl., *A. baezai*, Gater, *A. separatus*, Leic., and *A. similissimus*, Strickl. & Chowdh., which, although they are not all very closely related according to the characters of the adults, are distinguished in the larval stage by possessing the " cockade " type of palmate hair.

LOWE (G. H.). **Malaria in Rice-fields.**—*Malayan Med. J.*, viii, no. 3, pp. 190–192, 2 refs. Singapore, September 1933.

A brief account is given of outbreaks of malaria occurring in three areas in Malaya previously believed to be healthy. In two areas, the only new factor appeared to be the establishment of rice-fields, in which *Anopheles hyrcanus*, Pall., was very abundant ; in the third, rice cultivation had been in progress for several years, but the outbreak occurred after a period of flooding, at a time when *A. hyrcanus* was numerous in pools remaining in dry-rice fields. None of the species associated with the transmission of malaria in Malaya were found, with the exception of rare individuals of *A. umbrosus*, Theo., and a few larvae of *A. aconitus*, Dön., which is, however, a doubtful vector. It is suggested that *A. hyrcanus* may cause outbreaks when breeding-places are created by the opening of new rice-fields or the flooding of new areas [*cf. R.A.E.*, B, xii, 80]. In such areas, the population is not yet settled, domestic animals are almost entirely absent, and fish and predacious insects are relatively rare.

NIESCHULZ (O.). **Over de reactie van** *Stomoxys* **op verschillende temperaturen.** [On the Reaction of *Stomoxys* to various Temperatures.]—*Veeartsenijk. Meded.*, no. 80, pp. 37–44, 1 fig., 2 refs. Buitenzorg, 1933. (With Summaries in German and English.)

In further experiments with the same apparatus on the reaction of *Stomoxys calcitrans*, L., to various temperatures [*R.A.E.*, B, xxi, 187], over 3,000 observations were made with 250 flies. The average preferred temperature was 27·7°C. [81·86°F.] for females and 28·8°C.

[83·84°F.] for males, the influence of relative humidity being negligible. The fact that the optimum temperature is so high suggests that *S. calcitrans* is not well adapted to the European climate.

Over een Dermatitis squamosa et crustosa circumscripta bij het rund in Nederlandsch-Indië, genaamd cascado. [On a Dermatitis of Oxen in the Netherlands Indies called Cascado.]

BUBBERMAN (C.) & KRANEVELD (F. C.). **I. Onderzoekingen over aard en wezen der cascado.** [I. Investigations on the Nature of Cascado.]—*Veeartsenijk. Meded.*, no. 80, pp. 45–84, 1 fig., 6 pls., 2 maps.

IHLE (J. E. W.) & IHLE-LANDENBERG (M. E.). **II.** *Stephanofilaria dedoesi* **(n. gen., n. sp.), een Nematode uit de huid van het rund.**—*T.c.*, pp. 85–89, 3 pls., 3 refs. Buitenzorg, 1933. (With Summaries in German and English.)

The second paper describes *Stephanofilaria dedoesi*, gen. et sp. n., which was found in Northern Celebes and Southern Sumatra in the hide of oxen suffering from a form of dermatitis, of which it is probably the cause. The first paper deals with investigations on this disease. Transmission experiments with *Tabanus rubidus*, Wied., and *Stomoxys calcitrans*, L., gave negative results; experiments with *Lyperosia exigua*, de Meij., and other insects will be reported on later.

NIESCHULZ (O.). **Over de beteekenis van bloedzuigende insecten bij de verspreiding van miltvuur.** [On the Importance of Blood-sucking Insects in the Spread of Anthrax.]—*Ned.-Ind. Bl. Diergeneesk.*, xliv, pp. 46–51. Buitenzorg, 1932.

Commenting on recent outbreaks of anthrax among domestic animals in the Netherlands East Indies, the author considers that blood-sucking insects, especially Tabanids, are concerned in its spread, and refers to his experiments in this connection [*R.A.E.*, B, xvii, 230].

MCCULLOCH (R. N.). **A promising new Blowfly Dressing.**—*Agric. Gaz. N.S.W.*, xliv, pt. 9, pp. 711–712. Sydney, 1st September 1933.

In the course of preparing mixtures for trial as jetting fluids [*R.A.E.*, B, xx, 232], many larvicides were tested on sheep already attacked by blow-flies. The results indicated that some of the preparations might be used effectively as dressings, but it was found that although suspensions of insoluble arsenicals killed the maggots in a few hours, they failed in many cases to give lasting protection, because they did not adhere to the raw surfaces or were washed away by the exudate from the wound. Experiments were therefore undertaken with various arsenical pastes, of which the most successful was made by mixing ½ oz. Paris green with 5½ oz. kaolin and shaking the dust in a bottle with 18 oz. soft soap solution (1–2 per cent.). This paste was found to wet the wool well and to deposit on the wound and surrounding skin a much heavier film of toxic material than the Paris green suspension alone. It appeared to have an irritating effect on the maggots, although in some cases they were not all driven from the wound immediately. Moreover, the dry powder left by the paste dressing disappears to a certain extent after a few days from the clean wool surrounding the wound, whereas the Paris green suspension alone

leaves a lasting stain. This preparation also appears to be more effective than other dressings in preventing further attack on treated sheep.

LEGG (J.). **The Occurrence of** ***Anaplasma marginale*** **Theiler 1910 in northern Queensland.**—*Pamph. Coun. Sci. Industr. Res. Aust.*, no. 38, 31 pp., 2 figs., 2 charts, 18 refs. Melbourne, 1933.

In the course of a preliminary survey of the forms of piroplasmosis affecting cattle in Queensland, in addition to *Piroplasma bigeminum*, the causal organism of true "redwater," *Theileria mutans*, which causes little inconvenience, and *Anaplasma marginale*, which produces a very serious disease, were found for the first time in Australia. The vector of *A. marginale* in Australia has not yet been determined, but it is significant that it has only been found in cattle infested with ticks of the genus *Boophilus*, and up to the present all animals bred and maintained in a tick-free condition have been found susceptible to artificial inoculation.

Annual Report of the Department of Veterinary Science and Animal Husbandry, Tanganyika Territory 1932.—Fol., 95 pp. Dar-es-Salaam, 1933. Price 4*s*.

In the section on "Trypanosomiasis and Tsetse Fly" (pp. 7–9), H. J. Lowe points out that nearly three-quarters of Tanganyika Territory is infested with *Glossina*, and infection of cattle with trypanosomiasis was recorded during 1932 from practically every district where live-stock exists. In many parts of heavily stocked areas, the cattle are forced by drought to seek pasture in fly-infested bush for variable periods, depending largely on the extent and distribution of the rainfall. It was previously thought that cases of infection found at places far distant from areas infested with *Glossina* were probably due to mechanical transmission by other biting flies from an infected animal recently brought through such an area, but the discovery at the station at one of these places of *G. pallidipes*, Aust., carried in by trains, suggests an explanation that may apply to the others. The author considers that the mechanical transmission theory can only be accepted with reserve, and only where cyclical transmission is definitely impossible.

Comparatively rapid advances of the fly have been recorded, and it is estimated that in one area alone some 59,000 acres of grazing have been deserted during 1932; one main stock route has had to be abandoned owing to extremely heavy infestation with *G. morsitans*, Westw. To check the accidental transport of flies in trains, the clearing of bush for about a mile on either side of the railway should be attempted by making conditions of settlement attractive to natives.

In "Research on *Oestrus ovis* (Treatment)" (pp. 22–24), S. A. Evans describes experiments in which successful results were obtained from injection of equal parts of liquid paraffin and carbon bisulphide into the nasal cavities of sheep infested with larvae of *Oestrus ovis*, L. [*cf.* *R.A.E.*, B, xix, 223]. A dose of 2 cc. of the mixture is injected on each side by means of a strong hypodermic needle driven directly into the frontal sinus near the median line, parallel to the supra-orbital process of the frontal bone; in merino rams, the injection is made ¼ in. from the base of each horn. It was found advisable to release each sheep immediately after treating one side owing to the temporary suffocating effect of the carbon bisulphide; the second injection, when the animal is quiet, is tolerated more readily. The method appears to be efficient

and reasonably safe, but reinfestation may occur within a short time of treatment.

In "Notes on Trypanosomiasis Research" (pp. 24–28), H. E. Hornby comments on the finding of two males of *G. pallidipes* on the laboratory farms, and suggests that the heavy infection of the herd of Indian buffalos [*R.A.E.*, B, xxi, 13] was due to their bulk and to their resemblance to the wild African species, which is known to be especially attractive to the fly. He does not, however, consider that mechanical transmission is of negligible importance in the spread of trypanosomiasis, even though attempts made by W. H. W. Baird to transmit *Trypanosoma brucei* and *T. congolense* by means of *Stomoxys*, *Hippobosca* and *Haematopota* gave negative results and healthy animals kept in close contact with others infected with *T. congolense* in the presence of numerous flies of the genera *Stomoxys* and *Haematopota* did not contract the disease [*cf.* xxi, 14].

Barber (H. G.). **A new Species of *Rhodnius* from Panama (Hemiptera : Reduviidae).**—*J. Wash. Acad. Sci.*, xxii, pp. 514–517. Washington, D.C., November 1932.

Dunn (L. H.). **A natural Infection of *Trypanosoma cruzi* Chagas found in *Rhodnius pallescens* Barber in Panama.**—*Amer. J. Trop. Med.*, xiii, no. 5, pp. 471–473, 3 refs. Baltimore, Md., September 1933.

In the first paper, *Rhodnius pallescens*, sp. n., is described from Panama, and the second records its natural infection with *Trypanosoma cruzi*, which has already been found in another Triatomid, *Panstrongylus* (*Triatoma*) *geniculatus*, Latr., in that country [*R.A.E.*, B, xx, 94]. A male, two females and a nymph of *R. pallescens*, collected from a native hut in a village near Panama City, produced the infection in a guineapig on which they were fed, as did the male and one of the females when fed together on other guineapigs. Three cases of Chagas' disease had occurred in this village in 1931, but none has been observed there since, though blood smears from all the inhabitants have been taken monthly for over two years.

Dunn (L. H.). **Observations on the Host Selection of *Ornithodorus talaje* Guern., in Panama.**—*Amer. J. Trop. Med.*, xiii, no. 5, pp. 475–483, 7 refs. Baltimore, Md., September 1933.

As *Ornithodorus talaje*, Guér., is a vector of relapsing fever in Tropical America [*R.A.E.*, B, xv, 158] and various animals have been found to be naturally infected with spirochaetes in Panama [xxi, 149], the host selection of this tick is of considerable importance. Notes are given on its occurrence on various hosts in Panama, comprising rats, dogs, cats, several species of monkey, opossum (*Didelphis*), fowls, and a snake. In only one instance [xx, 104] is it definitely known to have attacked man.

Becker (E. R.). **Host Specificity and Specificity of Animal Parasites.**—*Amer. J. Trop. Med.*, xiii, no. 5, pp. 505–523. Baltimore, Md., September 1933.

The dual conception that a particular parasite species is limited to a single host species and that a particular host species may harbour only one species of a particular general group of parasites is obsolete. Selected examples from among the Protozoa, worms and Arthropods support the two following generalisations : A particular parasite will

develop normally in as many hosts as provide adequate environment and mode of entrance ; and a particular host may harbour few or many parasites, whether or not they be closely related taxonomically, according to the environment and opportunities for entrance it provides.

Although parasitic Arthropods as a group tend to display under natural conditions a rather rigid host specificity, there are notable exceptions, and some that appear either monoxenous or oligoxenous in nature have been reared under laboratory conditions on a wide variety of hosts. Very few of the ticks and mites can be said to be strictly host-specific, and certain ticks, such as *Dermacentor venustus*, Banks (*andersoni*, Stiles), have a very wide range of hosts. Although fleas as a group tend to confine themselves to particular animals, they will attack others if in need of food. A particular mammal may also be the natural host of more than one species of flea. *Cimex lectularius*, L., will attack animals other than man in case of necessity. Host specificity is somewhat highly developed among sucking lice, and when they do occur on hosts that are not their natural ones, these are usually closely related species.

Papers noticed by Title only.

Jancke (O.). **Mitteilungen über Anopluren IV-IX.** [Communications on Anoplura IV-IX.]—*Z. Parasit.*, iv, no. 3, pp. 522–541, 6 figs., 18 refs. Berlin, May 1932. [Recd. November 1933.] [*Cf. R.A.E.*, B, xx, 84.]

Aschner (M.). **Experimentelle Untersuchungen über die Symbiose der Kleiderlaus.** [Experimental Investigations on Symbiosis in *Pediculus humanus*, L.]—*Naturwissenschaften*, xx, no. 27, pp. 501–505, 1 fig., 5 refs. Berlin, 1st July 1932.

Aschner (M.) & Ries (E.). **Das Verhalten der Kleiderlaus bei Ausschaltung ihrer Symbionten. Eine experimentelle Symbiosestudie.** [The Behaviour of *Pediculus humanus* L., with its Symbionts excluded. An experimental Study in Symbiosis.]—*Z. Morph. Oekol. Tiere*, xxvi, no. 4, pp. 529–590, 24 figs., 11 refs. Berlin, 1933.

Waterston (J.). **The Louse as a Menace to Man. Its Life-history and Methods for its Destruction.**—*Econ. Ser. Brit. Mus. (Nat. Hist.)*, no. 2 (2nd Edn.), 20 pp., 4 figs. London, 1933. Price 4*d*. [See *R.A.E.*, B, x, 67.]

Ancona (L.). **Los piojos del hombre y las enfermedades que transmiten.** [The Lice of Man and the Diseases they transmit.]—*Foll. Inst. Biol.*, no. 9, 31 pp., 8 figs., 47 refs. Chapultepec, Mexico, 1931. [Recd. October 1933.]

Fernando (W.). **The Development and Homologies of the Mouthparts of the Head-louse** [*Pediculus capitis*, DeG.].—*Quart. J. Micr. Sci.*, (N.S.) lxxvi, no. 2, pp. 231–241, 10 figs., 4 refs. London, October 1933.

Wigglesworth (V. B.). **The Physiology of the Cuticle and of Ecdysis in** *Rhodnius prolixus* **(Triatomidae, Hemiptera) ; with special Reference to the Function of the Oenocytes and of the Dermal Glands.**—*Quart. J. Micr. Sci.*, (N.S.) lxxvi, no. 2, pp. 269–318, 15 figs., 3 pp. refs. London, October 1933.

JORDAN (K.). **Siphonaptera collected by Mr. F. Shaw Mayer in Mandated New Guinea** [including a new genus and 4 new species].—*Novit. zool.*, xxxix, no. 1, pp. 55–61, 8 figs. **Records of Siphonaptera from the State of New York** [including one new species].—*T.c.*, pp. 62–65, 2 figs. **Descriptions of Siphonaptera** [including 4 new species].—*T.c.*, pp. 66–69, 7 figs. **A Survey of the Classification of the American Species of** *Ceratophyllus* **s. lat.** [erecting 10 new genera].—*T.c.*, pp. 70–79. Tring, 23rd October 1933.

STEWART (M. A.). **Revision of the List of Siphonaptera from New York State.**—*J. N. Y. Ent. Soc.*, xli, no. 3, pp. 253–262, 14 refs. New York, N.Y., September 1933.

PRADO (A.). **Uma nova pulga** [*Rhopalopsyllus agilis*, sp. n., from Brazil] **do gambá** [*Didelphis aurita*].—*Rev. Ent.*, iii, no. 3, pp. 322–325, 3 figs. Rio de Janeiro, 25th September 1933.

BORGMEIER (T.). **A proposito da nomenclatura dos Tabanidae da região neotropica.**—*Rev. Ent.*, iii, no. 3, pp. 286–303. Rio de Janeiro, 25th September 1933.

KRÖBER (O.). **Das Subgenus** *Neotabanus* **der Tabanidengattung** *Tabanus* **s. lat.**—*Rev. Ent.*, iii, no. 3, pp. 337–367. Rio de Janeiro, 25th September 1933.

HANDSCHIN (E.). **Die Rolle von Temperatur und Feuchtigkeit im Auftreten und in der Verbreitung von** *Lyperosia exigua* **de Meij.** [The Rôle of Temperature and Humidity in the Occurrence and Distribution of *L. exigua* (in Java and Australia).]—*Veeartsenijk. Meded.*, no. 80, pp. 23–33, 9 refs. Buitenzorg, 1933. [*Cf. R.A.E.*, B, xx, 258 ; xxi, 257.]

PATTON (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Species of the Genus** *Musca*, **based on a Comparative Study of the Male Terminalia. II. A practical Guide to the Palaearctic Species.**—*Ann. Trop. Med. Parasit.*, xxvii, nos. 2–3, pp. 327–345, 397–430, 22 figs., 5 refs. Liverpool, July, October 1933. [*Cf. R.A.E.*, B, xx, 282.]

PATTON (W. S.). **A new haematophagous Species of** *Musca* [*greeni*, sp. n.] **from Malaya.**—*Ann. Trop. Med. Parasit.*, xxvii, no. 3, pp. 477–480, 2 figs. Liverpool, 21st October 1933.

CORSON (J. F.). **A Modification of Lloyd and Johnson's Method of Proboscis and Gland Dissection in Tsetse-flies** [*Glossina*].—*Ann. Trop. Med. Parasit.*, xxvii, no. 3, p. 481. Liverpool, 21st October 1933. [*Cf. R.A.E.*, B, xii, 85.]

WALCH (E. W.). **On the Relation between the Preference for Animal and Human Blood of Netherland-Indian** *Anopheles* **and their Ability to transmit Malaria under Natural Conditions.**—*Acta brev. neerl. Physiol.*, ii, pp. 206–210. Amsterdam, 1932. [Recd. October 1933.] [*Cf. R.A.E.*, B, xx, 167.]

ZOTTA (G.) & TEODORESCO (A. M.). **Formule leucocytaire de la chenille de** *Galleria mellonella* **infectée par le** *Leptomonas* [*Herpetomonas*] *pyrrhocoris*.—*C. R. Soc. Biol.*, cxiv, no. 30, pp. 314–316. Paris, 1933.

INDEX OF AUTHORS.

A reference in heavy type indicates that a paper by the author has been noticed.

GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets, it signifies that the name is not the one adopted.

A.

B.

C.

D.

E.

F.

H.

M.

*For relation to disease see also under Dengue, Encephalomyelitis (Equine), Filariasis, Herpes, Malaria, Rift Valley Fever, Tularaemia and Yellow Fever.

P.

Q.

R.

S.

T.

U.

V.

W.

X.

Y.

Z.

A.